МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ
«ХАРКІВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ»

О. Я. Лазарєва, О. О. Ковтун, Л. В. Дьомочка

РОЗМОВЛЯЄМО ПРО НАУКУ АНГЛІЙСЬКОЮ

Навчальний посібник
для студентів всіх спеціальностей
з підготовки до вступних іспитів з англійської мови у магістратуру

O. Lazareva, O. Kovtun, L. Dyomochka

SCIENCE SPEAKS ENGLISH

Book for the students of all departments
to prepare for master's courses entrance exams in English

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У посібнику надано аутентичні текстові матеріали та вправи до них для розвитку всіх аспектів мовленнєвої діяльності. Тематика текстів охоплює сучасні тенденції розвитку науки і технології у різних сферах, що дозволяє суттєво розширити словниковий запас та кругозір студентів. Спеціальний розділ присвячений розвитку грамотності усної та писемної мови.

Призначено для студентів всіх спеціальностей, що готуються до вступу до магістратури.

Бібліогр. 15

Лазарєва О. Я.

Л 17 Розмовляємо про науку англійською: навч. посіб. / О. Я. Лазарєва, О. О. Ковтун, Л. В. Дьомочка – Харків : НТУ «ХПІ», 2019. – 276 с.

O. Lazareva

Л 17 Science speaks English: textbook / O. Lazareva, O. Kovtun, L. Dyomochka – Kharkiv: NTU “KhPI”, 2019. – 276 p.

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The book features authentic texts and exercises to them to develop all aspects of language activity. The texts cover the topics devoted to modern tendencies in science and technology in different spheres, which significantly expands students’ vocabulary and outlook. A special section is devoted to enhancing accuracy in speaking and writing.

The book is designed for students of all majors who are going to enter master’s courses.

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ВСТУП

Для кого цей посібник?

Навчальний посібник «Science speaks English» призначений для широкого кола студентів технічних спеціальностей, що вивчають англійську мову. Зміст та методика опрацювання матеріалу передбачають певні базові знання англійської мови та володіння загальнонауковою термінологією.

Що містить посібник?

За змістом текстові матеріали охоплюють широкий спектр проблем науки і техніки сьогодення: від мікробів і комах до нанотехнологій та дослідження інших планет. За стилем тексти є науково-популярними. Перевагами такого стилю для тих, хто вивчає англійську мову за фаховим спрямуванням, є поєднання легкої, майже розмовної, форми викладення матеріалу – з одного боку, і насиченості фаховою термінологією – з іншого. Крім того, тексти запозичені з автентичних англомовних інформаційних джерел, що дає змогу студентам опановувати сучасну «живу» мову.

Як працювати з посібником?

Посібник складається з 2 основних частин:

- короткі есе про нові дослідження у різних галузях науки і технології (36 текстів);
- граматичний довідник з вправами.

Кожна секція (Unit) першого розділу – «Read carefully» – містить текст, споряджений численними лексико-граматичними вправами на розвиток різних аспектів мовленнєвої діяльності.

Перед кожним текстом студенти знайдуть короткий словничок, в якому надається контекстний переклад слів і словосполучень.

Перевірити розуміння тексту можна за допомогою відповідей на запитання щодо його змісту.

Для розвитку розмовних навичок пропонується декілька лексичних моделей з даного тексту (Speech Patterns), які закріплюються шляхом перекладу з української.

Виконання низки наступних лексичних вправ (Vocabulary, Practice) дозволить студентам розширити свій словниковий запас та правильно використовувати тематичну лексику в мові.

Повторення граматичних особливостей англійської мови (Grammar Focus) відбувається на прикладах їх використання у «живих» професійно-орієнтованих текстах.

Після опрацювання кожної секції (Unit) пропонуємо складати письмову анотацію до тексту. Рекомендації щодо її змісту та загальновживані мовні конструкції надано в Додатку 2.

Другий розділ – «Speak accurately» – містить коротко викладені граматичні правила та численні вправи на вдосконалення грамотності. Здебільшого, текстовий матеріал для вправ запозичений з автентичних наукових джерел.

У додатках надано функціональні структури академічного мовлення з вправами з їхнього використання (Appendix 1); рекомендації щодо складання анотації (Appendix 2); таблиця неправильних дієслів (Appendix 3); таблиці часових форм дієслів в активному та пасивному стані (Appendix 4).

Бажаємо успіху!

SECTION 1. READ CAREFULLY

UNIT 1. SCIENTISTS TO DRILL DEEP THROUGH EARTH'S CRUST

PRE-READING

Look through the active vocabulary. Predict the main idea of the article below.

ACTIVE VOCABULARY

crust	земна кора	to liken	порівнювати
a mantle	мантія	a bid	намагання
to drill	свердлити	retrieval	добування, виймання
viability	життєздатність	a sample	зразок
a quest	пошуки		

READING

1.1. Read the text and answer the questions.

A team of scientists is preparing a new attempt to drill through the Earth's crust to the mantle below **for the first time ever**. The team will soon drill beneath the Pacific to test the viability of such an operation, and say an attempt to reach the mantle could begin in 2018.

They've selected prospective sites under the Pacific Ocean where the crust is at its thinnest – just six kilometres.

Dr Damon Teagle, of the UK's National Oceanography Centre in Southampton, is leading the quest. He likens the bid to the retrieval of Moon rocks by the Apollo programme and says samples from the mantle will tell us how our planet was formed and how it's changing: "Just as the Moon rocks told us about the composition of the Moon and how that relates to the early formation of the Earth itself, so will these samples as well."

1. When are the researchers going to start drilling the Earth crust? 2. Where do they plan to drill? 3. Who is the leader of the project? 4. What do the scientists want to learn from the samples retrieved? 5. What programme do they compare their attempts with? 6. What is the thickness of the thinnest part of the crust?

SPEECH PATTERNS

1.2. Analyse the speech pattern and translate the sentences into English using the pattern.

for the first time <u>ever</u>	вперше <u>за всю історію</u>
The longest bridge ever was built in 2010 in China.	Найдовший в світі міст був побудований у 2010 році в Китаї.

1. Блакитний кит – найбільша тварина в світі. 2. «Пірати-3» залишається найдорожчим фільмом усіх часів. 3. У 2013 році продаж планшетів вперше в історії перевищив продаж ноутбуків. 4. Рухаючись зі швидкістю 253000 кілометрів на годину, зонд «Геліос» є найшвидшим космічним супутником у світі. 5. Є багато претендентів на звання найсильнішого чоловіка в світі.

VOCABULARY

1.3. Match the English and Ukrainian words.

1	roc_	a	намагання
2	_uest	b	добування
3	ben_ _th	c	життєздатність
4	s_ _ple	d	земна кора
5	c_ust	e	пошуки
6	retr_ _val	f	нижче
7	_id	g	гірська порода
8	_ _ _bility	h	зразок

1.4. Give synonyms to the following words from the texts:

an attempt, a team, to test, viability, to reach, to begin, to select, prospective, a site, a quest, to liken, a retrieval, to form, to relate, as well.

1.5. Find the words in the text that are nouns and verbs at the same time, e.g. *an attempt – to attempt*. Translate them.

PRACTICE

1.6. Translate into English.

1. Вчені збираються вивчити зразки породи. 2. Під Тихим океаном земна кора найтонша. 3. Пошуки можуть початися у 2018 році. 4. Вчені готуються

просвердлити земну кору до мантії. 5. Каміння з Місяця було привезене місією Аполлон. 6. Дослідники хочуть дізнатись, як формувалась наша планета.

GRAMMAR FOCUS

1.7. Put *a* / *an* or *the* into each gap. Sometimes no article is necessary. Note:

a (an) book	one of many similar books
the book	the book we are talking about
books	any books

___ group of scientists is going to make ___ experiment by drilling ___ earth's crust. They will be drilling beneath ___ Pacific ocean. ___ tests will start in 2018. ___ researchers have selected ___ places in ___ Pacific where ___ crust is ___ thinnest. They will take ___ samples from ___ mantle. ___ head of ___ programme is Dr Damon Teagle. He is giving ___ interview to ___ British journalists. ___ journalists are from ___ BBC.

FOLLOW UP

1.8. Formulate 2-3 problems the researchers may encounter while drilling. Look for the information on the topic in the Internet to find out whether these problems really occurred and how they were solved. Prepare a 1-2 minute talk.

UNIT 2. INSECT-INSPIRED ROBOTS

PRE-READING

Think of the forms that robots can take and the purposes they serve. In pairs discuss a new possible type of robot and invent a cute name for it. Report your ideas to the class.

ACTIVE VOCABULARY

an insect	комаха	an edge	край
to arrange	впорядковувати	via	шляхом, за допомогою
variety	різноманітність	to blink	блимати
a swarm	рій, зграя	acceptable	прийнятний
spindly	довгий та тонкий	to inspire	надихати
to shuffle	переміщуватись	to sweep	підмітати, чистити

READING

2.1. Read the text and complete the sentences.

Engineers in the US have created a group of more than 1,000 identical robots. Using a system modelled on insects, the "Kilobots" work together to arrange themselves into a variety of shapes.

The largest swarm of robots in the world lives on a table in a lab at Harvard University. **Each about the size of** a sushi roll, with three spindly legs, the robots are all loaded with the same program and given a simple black-and-white picture.

When all 1,000 are given the "go" signal, individual robots shuffle slowly around the edge of the swarm, communicating via blinking infra-red lights.

Once they're in an acceptable position inside the required shape, they stop.

Tested on three different shapes, the robots took up to 12 hours to form each one.

But their record-breaking display of teamwork, inspired by insect behaviour, is a step towards more ambitious robotic swarms, which could sweep disaster sites or clean up polluted environments.

1. Engineers from Harvard University have created ___. 2. The robots' swarm looks like ___. 3. Their task is ___. 4. Each robot is very small, just ___. 5. The robots in the swarm communicate via ___. 6. In future robotic swarms can be used ___.

SPEECH PATTERNS

2.2. Analyse the pattern and translate the sentences into English using the pattern.

Each about the size of ...	кожний розміром приблизно з ...
When a kangaroo baby is born, it **is about the size** of a bean.	Коли народжується кенгуреня, воно **має розмір приблизно** з квасолину.

1. Міжнародна космічна станція має розмір приблизно з футбольне поле. 2. Фірма Інтел розробила найменший в світі 3G модем – розміром десь з монетку. 3. Новий розкладний велосипед у складеному вигляді має розмір десь як парасолька. 4. Комп'ютер SlimBox IV PC компанії Raydget має розмір з плитку шоколаду. 5. Серце людини має приблизно такий же розмір, як його кулак.

VOCABULARY

2.3. Find in the text the equivalents of the following expressions:

зграя роботів; чорно-біла картинка; прийнятна позиція; потрібна форма; забруднене середовище; місце катастрофи; рекордна демонстрація групової роботи; інфрачервоні лампочки.

2.4. Match the words from the box that correspond to the following definitions:

a) a disaster; b) to display; c) to blink; d) a picture; e) to communicate; f) a robot; g) behaviour; h) environment; i) a swarm; j) to arrange; k) an insect;

1) any automated machine programmed to perform specific mechanical functions in the manner of a man; 2) a large mass of small animals, esp. insects; 3) external conditions or surroundings, especially those in which people live or work; 4) an occurrence that causes great distress or destruction; 5) any small air-breathing invertebrate usually having jointed limbs, a segmented body, and an exoskeleton; 6) to exchange thoughts, feelings, or ideas by speech, writing, gestures, etc.; 7) to close and immediately reopen (the eyes or an eye), usually involuntarily *or* to shine intermittently, as in signalling, or unsteadily; 8) the action, reaction, or functioning of a system, under normal or specified circumstances.

2.5. Say whether the statements are TRUE or FALSE. If FALSE, give the correct version.

1. The robots are called “Kilobots” because they weigh 1 kilogram. 2. The robots are taught to work in a team. 3. The robots are painted black and white. 4. When working the robots continuously shine infra-red light. 5. The aim of robots is to create different figures. 6. It takes robots more than 12 hours to make a required shape. 7. All robots of the team work according to one program. 8. The robots stop when they are given a special signal. 9. There are some robots in the team that look and behave differently. 10. Each robot is an exact copy of an insect.

GRAMMAR FOCUS

2.6. Put questions to the underlined parts of the sentences in writing. Note the order of words in questions.

Question word(s)	**Auxiliary verb**	**Subject**	**Main verb**	**...**	**?**
-	**-**	*Who*	*lives*	*in this house*	*?*
-	*Does*	*he*	*live*	*in this house*	*?*
Where	*does*	*he*	*live*	-	*?*
In what house	*does*	*he*	*live*	-	*?*

1. Engineers in the US have created a group of more than 1,000 identical robots. 2. "Kilobots" work together to arrange themselves into a variety of shapes. 3. The largest swarm of robots in the world lives on a table in a lab at Harvard University. 4. Robots in the swarm communicate via blinking infra-red lights. 5. The robots took up to 12 hours to form each required shape. 6. Robotic swarms will sweep disaster sites or clean up polluted environments.

FOLLOW UP

2.7. Find the related information on the topic in the Internet and prepare a 1-2 minute talk.

UNIT 3. WALK OR CYCLE FOR A HAPPIER COMMUTE

PRE-READING

Look through the active vocabulary. Predict the main idea of the article below. What are the possible ways to commute in your city?

ACTIVE VOCABULARY

a commute	дорога з дому на роботу	crucially, ...	важливо те, що
an evil	зло	dramatic impact	значний вплив
to challenge	піддавати сумніву	wellbeing	благополуччя
an assumption	припущення		

READING

3.1. Read the text and answer the questions.

For many people commuting is a necessary evil. Most see going by car or van as the "least worst" option. The study by the researchers at the University of East Anglia challenges that assumption.

It suggests walking, cycling or travelling by public transport can lift the mood. Crucially, it suggests those who switch from the car to an active commute feel better across a range of psychological measures, including concentration, decision making and the ability **to face problems**.

The researchers say policies encouraging people to leave their cars at home could have a dramatic impact on public wellbeing.

1. What transportation devices do most people use to commute? 2. What do the researchers from the University of East Anglia study? 3. What vehicles do they suggest instead of cars? 4. Why do they think this is a better option? 5. What psychological activities do people cope with better when they use active ways of commute? 6. What may improve according to the scientists?

3.2. Choose the correct option.

1. Most people consider that commuting ___.

a) is unbearable; b) is necessary; c) can be put up with; d) is evil

2. a) All people go to work by car or van. b) Only rich people go to work by car or van.

c) Between car and van most people choose the worst one. d) Many people go to work by car or van.

3. The researchers at the University of East Anglia think that ___.

a) walking is better than going by public transport; b) cycling takes the same time as going by car; c) you can go by lift with your bicycle; d) you will feel better if you go to work on foot or by bicycle.

4. Those who do not go to work in their cars ___.

a) are more effective in solving problems; b) cannot make decisions themselves; c) face big problems; d) ignore psychological measures such as concentration.

5. The researchers suggest that ___

a) people should never use their cars for commute; b) city authorities should encourage people to use more active commute; c) for most people not using their cars will be a drama; d) public wellbeing depends on the possibility to own a car.

SPEECH PATTERNS

3.3. Analyse the speech pattern and translate the sentences into English using the pattern.

to face (problems etc.)	стикатися з, сміливо зустрічати (проблеми тощо)
There are some common problems that students face at college.	Існує декілька загальних проблем, з якими стикаються студенти в коледжі.

1. Чи грозить вимирання настільним комп'ютерам? 2. Нас чекає сувора зима. 3. Всі вікна цього готелю виходять на парк. 4. На всі застарілі фабрики очікує закриття. 5. Всі комп'ютерні компанії стикаються зі скаргами користувачів.

VOCABULARY

3.4. Translate the word combinations. Make sentences of your own using them.

Necessary evil; the worst option; to travel by car; to lift the mood; to make decision; to face problems; a dramatic impact.

3.5. Fill in the gaps with the words from the text.

1. Going from home to work is called ___. 2. When we decide what to do we always choose from various ___. 3. When we are sad, an unexpected present or even a chocolate bar can change our ___. 4. When people feel little reliance in their powers, a good thing is to ___ them. 5. Our health and happiness makes our ___.

GRAMMAR FOCUS

3.6. One word in each sentence is extra. Cross it out.

On your drive to work, have you ever noticed a cyclist obviously commuting and admired a that person? Have you were thought it would be cool to ride your bike to work, or home from the office? Perhaps, it's crossed your mind that bike commuting not only is helps the environment and saves gas money; but it could help you stay fit, healthy and burn a few extra calories. So why not start at now? Lots of people are commute on their bicycles, why not you?

FOLLOW UP

3.7. Find the information on the environmentally friendly ways of commuting in the Internet and prepare a 1-2 minute talk expressing your own attitude to the topic discussed.

UNIT 4. SASER: THE SONIC LASER

PRE-READING

1. The word *sonic* means *relating to sound, sound waves, or the speed of sound*. Can you predict how a sonic laser works?
2. Quickly look through the text to find unknown words. Try to guess their meaning from the context. In case you fail, discuss the meaning of the words with your peers or consult the dictionary.

READING

4.1. Read the text and answer the questions.

This has been a good week for sonic physics. First came reports that scientists used sound waves to create a sonic black hole. Now, it seems that a different group of scientists have created something almost as cool: they used specially calibrated sound waves to form a sonic laser.

The lasers most people are familiar with are formed from beams of light with identical wave structures, added together to form one giant, coherent wave. The saser, created by scientists from the University of Nottingham, England, works the same way but with correlated sound waves instead of light waves.

The researchers started working on the idea in 2006, but **it wasn't until recently that** they finally got the saser to work. So far, they have only been able to generate sasers on the nanoscale, but even those small-scale sasers could have applications in computing, medical technology, and the development of super-fine sonogram sensors.

1. What are the two most recent discoveries in sonic physics? 2. What is the operation principle of a laser? 3. When did the researchers start working on saser? 4. What is the wavelength scale of today's sasers? 5. Where can sasers be applied?

SPEECH PATTERNS

4.2. Analyse the speech pattern and translate the sentences using the pattern.

it wasn't until recently that (+ Past Simple)	і тільки недавно ...
It was not until the first half of the 20th century that scientists began to understand what causes the sunspot cycle.	Тільки в першій половині 20-го століття вчені почали розуміти, що саме викликає циклічність сонячних плям.

1. Тільки зараз я зрозумів, як багато мені ще треба вчитись. 2. Тільки минулого року йому вдалось знайти пристойну роботу. 3. Тільки в кінці 90-х ми отримали позитивні результати експерименту. 4. Тільки в 1978 році вчені з'ясували, що Плутон має супутник. 5. Тільки з появою Google Maps у 2005 році цифрові карти стали широко використовуватись.

VOCABULARY

4.3. Match the words from the text with their synonyms. Add synonyms if possible.

1	researcher	a	to utilize
2	to start	b	team
3	to use	c	enormous
4	to create	d	probe
5	group	e	eventually
6	identical	f	scientist
7	giant	g	equal
8	coherent	h	to produce
9	finally	i	correlated
10	sensor	j	to commence

4.4. Look at the underlined words in the text above. They are used to emphasize ideas. Paraphrase the following sentences making the underlined fragments more emphatic. Use the expressions: *absolutely; super; only; it was not until; significantly; extremely; dramatic*. **For more practice on emphasizing see Appendix 1.**

1. Penicillin, the first true antibiotic, was discovered in 1928 by Alexander Fleming, Professor of Bacteriology at St. Mary's Hospital in London. 2. Water bears, also known as tardigrades, are the animals that can survive the extreme environment of outer space. 3. Researchers at North Carolina State University say they have developed a technique for creating a substance they are calling Q-carbon, which is harder than diamond. 4. Adidas has just created a futuristic shoe made with a very strong, biodegradable silk. 5. The electrodes used for welding must be clean and dry. 6. There has been a big increase in the number of people who use the Internet to do business. 7. Excessive cooling, a state where liquids do not solidify even below their normal freezing point, still puzzles scientists today.

PRACTICE

4.5. In the following text all the gaps between the words of the sentences are missing. Restore the gaps and retell the text.

Soundwavesarelongitudinalwaves,madebyparticlesvibrating.
Thesevibrationsarepassedalongtonearbyparticles,whichthenpassthemonagain.
Thisishowsoundwavestravelalongthroughsolids,liquidsandgases.
Whentheparticlesvibratenearyoureardrum,youreardrumvibrates.
Thismovementgetsturnedintoanelectricalsignal,whichisthenpassedontoyourbrain.
Soundwavesneedparticlestotravelalong,sotheycannottravelinspace,oranyothervacuum.
Youcanseethesun,butyoucan'thearthemassiveexplosionsthataretakingplacethere,asligh tcantravelinspacebutsoundcan't.

GRAMMAR FOCUS

4.6. Note different functions of V-ed used in the text:

1) scientists *used* sound waves; (V-II – Past Simple)
2) scientists *have created* something; (*have* + V-III – Present Perfect)
3) specially *calibrated* sound waves; (V-III + Noun – Partciple-II before Noun)
4) lasers *are formed* from beams of light; (*be* + V-III – Present Simple Passive)
5) wave structures, *added* together. (noun + V-III – Participle-II after Noun)

Use similar structures to translate the following sentences into English.

1. Явище супер-охолодження було відкрите (to discover) Фаренгейтом у 1724 році. 2. Марія Кюрі відкрила (to discover) елемент радій у 1898 році. 3. Штучно створені (to create) клітини вже привернули (to attract) багато уваги як замінники природнім клітинам. 4. Благородні гази також називаються (to call) інертними,

оскільки вони не здатні реагувати з іншими елементами. 5. Робот, створений (to create) студентом Гарварда, виглядає як комаха і вміє літати. 6. Ганг вважається (to consider) найбільш забрудненою (to pollute) річкою в Індії. 7. Великий адронний коллайдер почав (to start) працювати у вересні 2008 року. 8. За останні 100 років середня температура в світі підвищилась (to increase) на 0.8 градусів Цельсія. 9. Атоми більшості металів організовані (to arrange) у регулярні структури, що називаються (to call) кристалічною решіткою. 10. У 2000 році Джек Кілбі отримав (to receive) Нобелевську премію за винахід інтегрованої (to integrate) схеми, яку він розробив (to develop) ще у 1958 році.

FOLLOW UP

4.7. Give your own explanations of the following objects. Use the structures: *X is a …; X is used for ...; X is designed for ….* See also Appendix 1 for practicing how to give definitions.

A sensor; a report; a wave; a black hole; sound; a laser; a sonogram.

UNIT 5. WHY ARE THE OCEANS SALTY?

PRE-READING

Can you give your explanation of the fact that water in seas and oceans is salty unlike that in rivers that flow into them?

ACTIVE VOCABULARY

to pick up	піднімати, підбирати	roughly	приблизно
amount	кількість	average	середній; середньостатистичний
rock	камінь; порода	due to	завдяки; через
river bed	дно річки	rate	швидкість
to evaporate	випаровуватись	influx	приплив
to dissolve	розчинятись	to dilute	розбавляти, розріджувати
to vary	змінюватись; відрізнятись		

READING

5.1. Read the text and answer the questions.

As water flows in rivers, it picks up small amounts of mineral salts from the rocks and soil of the river beds. This very-slightly salty water flows into the oceans and seas. The water in the oceans only leaves by evaporating (and the freezing of polar ice), but the salt remains dissolved in the ocean – it does not evaporate. So the remaining water gets saltier and saltier as time passes.

The salinity (salt content) of ocean water varies. The oceans and seas contain roughly 5×10^{16} tons of salts. One cubic foot of average sea water contains 2.2 pounds of salt.

The oceans are about 3.5% salt (by weight). Salinity is generally reported in terms of parts per thousand (abbreviated ppt or $^{0}/_{00}$), the number of pounds of salt per 1,000 pounds of water; the average ocean salinity is 35 ppt.

The saltiest water is in the Red Sea and in the Persian Gulf, which have a salinity of about 40 ppt (due to very high evaporation rates and low fresh water influx). The least salty seas are in the polar regions where both melting polar ice and a lot of rain dilute the salinity.

NB 5×10^{16} is pronounced *five times ten to power sixteen* or *five times ten to sixteen*; % is pronounced *per cent*.

1. How can water leave oceans? 2. Why does the water in oceans become saltier with time? 3. In what units is the salinity measured? 4. How salty are the oceans? 5. What are the most and the least salty parts of the world ocean?

SPEECH PATTERNS

5.2. Analyse the speech pattern and translate the sentences using the pattern.

in terms of	через; в термінах; в перерахунку на
The dial is calibrated in terms of frequency.	Шкала градуйована в одиницях частоти.

1. Ваше завдання – виразити один параметр через інший. 2. Нам пояснили це явище з точки зору фізики. 3. За обсягом це невелике судно. 4. В доларовому еквіваленті ціни на нафту залишились незмінними. 5. Ефективність

виробництва може вимірюватись через ряд критеріїв, таких як час, використання матеріалів та витрати.

VOCABULARY

5.3. Leave out an odd word from the sequences. Explain why.

1) rock, soil, stone, bed, sand; 2) to evaporate, to flow, to freeze, to solidify; 3) cold, salty, sweet, sour, bitter; 4) salinity, density, property, viscosity, transparency; 5) sea, ocean, river, lake, gulf, coast, pond, stream; 6) foot, pound, inch, centimeter, yard, ounce; 7) low, high, average, fresh; 8) as, but, and, of, though, which.

PRACTICE

5.4. Some units of measurements contain the word *per*, see e.g. paragraph 3. Find the appropriate quantity for each unit from the keys given below. Compose the sentences. Example: *The area of a country is measured in square miles or square kilometres.*

1) the speed of a vehicle; 2) the speed of rotation; 3) pressure; 4) the pixel density of a screen; 5) the density of a substance; 6) the doze rate; 7) electric current; 8) the speed of data transmission; 9) the resolving power of an eye; 10) the human pulse rate.

Keys: a) grams per cube meter; b) beats per minute; c) coulombs per second; d) micro-roentgens per hour; e) megabits per second; f) lines per millimeter; g) kilometers per hour; h) Newtons per square meter; i) pixels per inch; j) revolutions per minute.

GRAMMAR FOCUS

5.5. Insert articles where necessary.

1. ___ salinity is ___ ecological factor of ___ considerable importance, influencing ___ types of organisms that live in ___ body of water. 2. ___ salinity of ___ water body is measured in ___ parts per ___ thousand. 3. Under some conditions, ___ water can exist in all three states: solid, liquid and gaseous. 4. ___ Gulf Stream flows from ___ Gulf of Mexico across ___ Atlantic ocean to ___ Northern Europe. 5. ___ most of ___ salt in ___ oceans came from ___ land. 6. ___ humans and nearly ___ all mammals cannot drink ___ salt water. 7. ___ most marine creatures keep ___ salinity inside their bodies at about ___ same concentration as ___ water outside their bodies.

8. In 2010, ___ new standard for ___ properties of ___ seawater was introduced, ___ Thermodynamic Equation of ___ Seawater 2010 (TEOS-10).

FOLLOW UP

5.6. Find the examples of objects that also do not inherit the properties of their constituents.

UNIT 6. HOW THE SOUND OF RAIN HELPS ENGINEERS DIAGNOSE UNSAFE BRIDGES

PRE-READING

Think of positive and negative aspects of rain (3 points each). Explain your ideas.

ACTIVE VOCABULARY

rely (on)	покладатись (на)	concrete	бетон
to drag	тягнути	deck	настил
hollow	пустий	concern	турбота
tell-tale	сигнальний	lane	проїзд
delamination	розшарування	to mist	вкривати туманом

READING

6.1. Read the text and answer the questions.

To test the safety of a bridge, engineers rely on some pretty low-tech methods. One common way of doing it is to drag a chain across the bridge and listen in for the hollow-sounding spots. But, weirdly, an even-lower-tech method might speed things along: **Have the rain do** the work for you.

In the same way that structural defects can be detected with something solid, two engineers from Brigham Young University – Brian Mazzeo and Spencer Guthrie – are listening in for the tell-tale acoustics by splashing bridges with water. They're looking for something called "delamination". In a concrete bridge deck, the layers used to build the bridge can become separated over time – it's a major concern with some aging bridges. Right now, some of the processes (like the chain-dragging) can take hours, and shut down lanes for that time.

The water solution is simple, and could potentially fix the traffic problem. One day, the researchers say, it might be as easy as misting a bridge as they cruise by in a

car. (No, you don't have to wait for it to actually rain. Although that's more poetic than car-misting.) It might also **make its way** into related industries, like aircraft construction, where delamination of composite parts is a problem.

1. What is the traditional way of detecting damages in bridges? 2. What do the British engineers propose instead of the conventional method? 3. What are they looking for? 4. Why is the new method more effective? 5. Where can the new method be also used?

SPEECH PATTERNS

6.2. Analyse the speech pattern and translate the sentences using the pattern.

to have smth. / smb. + V	змусити щось/когось зробити щось; влаштувати так, щоб хтось зробив це
Have the rain do the work for you.	Нехай дощ зробить за вас цю роботу.
Eventually, he had his parents buy him a new tablet.	Врешті решт він змусив батьків купити йому новий планшет.

A. 1. Не змушуйте гостей чекати на вас. 2. Чи не могли б Ви влаштувати так, щоб вони зустрілись? 3. Нехай ветеринар огляне вашого собаку. 4. Щоб зупинити цю програму, просто натисніть на червону кнопку. 5. Зробіть так, щоб всі дізнались про цю новину якомога швидше.

to make one's way	пробивати собі дорогу; направлятись
He eventually made his way back to political life.	Зрештою він таки повернувся до політичного життя.

B. 1. Ці товари скоро потраплять на ринок. 2. Маленькій компанії нелегко пробитись у світі великого бізнесу. 3. Протягом багатьох років він наполегливо йшов до цього успіху. 4. Китай потрапив у Книгу рекордів Гінеса, збудувавши найдовший в світі міст довжиною майже 42 кілометри. 5. Після зимових канікул студенти повертаються до своїх гуртожитків.

VOCABULARY

6.3. Replace the highlighted words with their synonyms.

1. Sometimes engineers ***use*** some ***pretty*** low-tech ***methods***. 2. Surface ***defects*** can often be ***detected*** visually. 3. Earthquakes are not very ***common*** in this part of the world. 4. This looks like a good ***spot*** for the future exhibition centre. 5. Finding ways to ***speed up*** your computer is the most important thing you could do as a computer user. 6. Columbus was ***looking for*** a shorter ***route*** to India when he discovered America. 7. The ***major*** freeway was ***shut down*** after an accident yesterday. 8. There is no ***simple*** way to ***fix*** European refugee crisis.

6.4. Match the two parts of verb combinations. Compose sentences of your own with the collocations.

1	to rely	a	for smth.
2	to wait	b	smth. down
3	to drag	c	smth. with water
4	to splash	d	for smth.
5	to shut	e	on smth.
6	to look	f	smth. across the bridge

6.5. Paraphrase the sentences from the text using another way of expressing the degree of certainty, e.g.: *It might rain today. – Perhaps, it will rain today.* For more information and practice see Appendix 1 (Generalization)

1. An even-lower-tech method might speed things along. 2. Structural defects can be detected with something solid. 3. The layers used to build the bridge can become separated over time. 4. Some of the processes can take hours. 5. The water solution could potentially fix the traffic problem. 6. One day it might be as easy as misting a bridge. 7. The method might also make its way into related industries.

PRACTICE

6.6. Give your own examples of:

1) low-tech methods; 2) structural defects; 3) solid materials; 4) a tell-tale indicator, signal, or sign; 5) concrete constructions; 6) traffic problems; 7) composite materials.

GRAMMAR FOCUS

6.7. Use either Present Simple (V, Vs) or Present Continuous (*be* + V-ing) in the following sentences. Explain what has prompted your choice.

1. The world ocean acidity (to increase) constantly. 2. Our everyday food choices (to affect) global warming and the environment. 3. Today, the world's population (to grow) at a faster rate. 4. Now over one million household robots, and a further 1.1 million industrial robots, (to operate) worldwide. 5. Our auto-centric transportation system – built for the previous century – (to increase) pollution and the nation's addiction to oil. 6. The current methods of disposal of nuclear wastes from the reactors (to pose) major risks to the environment. 7. Many animal and plant species (to face) extinction due to alarmingly rapid habitat loss. 8. Health care (to require) high-quality science that is free from conflicts of interest. 9. We (to rely) on clean water to survive, yet right now we (to head) towards a water crisis. 10. Wind farms (to generate) clean, renewable energy.

FOLLOW UP

6.8. Find some other information on low-tech and hi-tech methods solving the same problem. Compare them.

UNIT 7. FLIES MOVE LIKE FIGHTER JETS

PRE-READING

Have you ever watched insects or animals moving? Can you give any analogies in technology?

ACTIVE VOCABULARY

a threat	загроза	barely	ледве
fighter jet	винищувач	discernible	помітний
to astonish	вражати	a creature	створіння
to pitch	падати	a grain	крупинка
to regain	відновлювати	to process	обробляти
abrupt	різкий, крутий	precisely	точно
to involve	включати (в себе)	to swat	прибити
subtle	ледь відчутний		

READING

7.1. Read the text and complete the sentences.

New research shows that when a threat comes into view, fruit flies make extremely fast turns similar to those made by fighter jets.

The research team were astonished by the speed with which fruit flies are able to change direction in mid-flight when faced with a threat.

Like fighter aircraft, they pitch, roll and regain stability, and all in five-thousandths of a second. High speed video shows that this complex and abrupt manoeuvre involves very subtle changes in the insect's wing beat that are barely discernible.

It's a mystery how a creature with a brain the size of a grain of salt is able to process visual information and translate it into precise muscular movements so quickly and precisely.

But according to the research team, it does help to explain why **flies are so difficult to swat.**

1. The researchers discovered that fruit flies can move similar to ___. 2. Like fighter aircraft they do such movements as ___. 3. The researchers recorded them with ___. 4. During the flight the insect's wings ___. 5. By size, a fly's brain can be compared with ___. 6. The fly can process ___ and translate it into ___.

SPEECH PATTERNS

7.2. Analyse the speech pattern and translate the sentences using the pattern.

Flies are difficult (easy, impossible) to swat.	Мух складно (легко, неможливо) прибити.
He is easy to be mistaken for his twin brother.	Його легко прийняти за його брата-близнюка.

1. Квантову теорію складно зрозуміти. 2. Цю планету легко побачити неозброєним оком рано вранці. 3. Поведінку елементарних частинок неможливо пояснити законами Ньютона. 4. Багатьох тварин дуже важко помітити в природних умовах через захисне забарвлення. 5. Металеві предмети під землею легко виявити за допомогою металошукачів.

VOCABULARY

7.3. Divide the following words into three groups: a) movements made by a fruit fly; b) general characteristics of any movement; c) types of movement.

to turn, manoeuvre, direction, movement, to roll, wing beat, speed, flight, to pitch.

7.4. Note the way the underlined words in the text emphasize the ideas. Use different ways of emphasizing to translate the following sentences. For practicing see also Appendix 1 (Emphasizing)

1. Цей автомобіль досягає швидкості 60 миль на годину всього за 3 секунди. 2. Під дією надзвичайно високого тиску матеріали змінюють свої фізичні та хімічні властивості. 3. Новий біосумісний сплав титану та золота є настільки міцним, що імпланти, виготовлені з нього, можуть служити набагато довше та надійніше. 4. Як вважають вчені з Каліфорнійського університету, паралельні всесвіти таки існують. 5. Вчені розробили компактний оптичний пристрій, який може генерувати абсолютно непередбачувані випадкові числа значно швидше, ніж існуючі технології.

7.5. Find in the text the words and expressions that compare the following objects with others: *fruit flies' movements; the size of the fly's brain; the way a fruit fly turns*. **Use these expressions in the sentences of your own comparing the objects in your field of study.**

PRACTICE

7.6. Insert suitable prepositions and compose sentences of your own using the word combinations:

1) the size ___ (a grain); 2) according ___ (the research team); 3) translate (information) ___ smth.; 4) similar ___ smth.; 5) faced ___ (a threat); 6) come ___ view.

GRAMMAR FOCUS

7.7. Each of the sentences below contains one mistake. Correct them.

1. Researchers are study the movements of fruit flies. 2. Flies can changed directions very abruptly. 3. A flies may instantly pitch, roll and regain stability. 4. All these movements takes only five thousandths of a second. 5. The fly's brain is the size of grain of salt. 6. The researchers did recorded the flight of the insects. 7. The flies

processes visual information. 8. The fly's wing movements is hardly discernible. 9. Flies difficult to swat.

FOLLOW UP

7.8. Find out and make a short report on what technologies or mechanisms mimic the behaviour of living creatures.

UNIT 8. ELECTRONICS AFFECT BIRD NAVIGATION

PRE-READING

Think of the ways humans and other living creatures navigate. What are the differences?

ACTIVE VOCABULARY

to disrupt	руйнувати	to plug	під'єднувати
to affect	впливати	mains	електрична мережа
to perform	виконувати	to interfere	перешкоджати
AM=amplitude modulated signal	амплітудно-модульований сигнал	satnav=satellite navigation	супутникова навігація
feat	подвиг; майстерність	to expose	піддавати
frequency	частота	bearings	місцезнаходження

READING

8.1. Read the text and complete the sentences.

Electrical devices may disrupt the migration of some birds, a study suggests. A German team has found that electromagnetic fields produced by equipment and AM radio signals affect the animals' navigational systems. The study is published in the journal Nature.

Some birds perform remarkable feats of navigation, migrating halfway around the world. And it's thought that a built-in compass, which senses the Earth's magnetic field, helps them to find their way.

But this latest study suggests that low frequency waves produced by devices plugged into the mains electricity could be interfering with this "inner satnav". Scientists found that migratory birds exposed to this electromagnetic noise lost all

sense of direction. But when the field was blocked out, they **found their bearings** again.

Researchers believe electrical interference could be a particular problem when birds fly over urban areas. They think the birds are forced to switch to back-up navigational systems, staying on course using the sun and stars instead.

1. Migration of some birds may be disrupted by ___. 2. A German team has found that animals' navigation system may be affected by ___. 3. While migrating, birds may cover ___. 4. The birds find their way because ___. 5. Because of the electromagnetic noise caused by electric devices which are plugged to the mains the birds ___. 6. When flying over urban areas, the birds turn on their back-up navigational system, that is ___.

SPEECH PATTERNS

8.2. Analyse the speech pattern and translate the sentences into English using the pattern.

to find one's bearings	зорієнтуватись; розібратись, що до чого
I was in New York for the first time and it took me a few days **to find my bearings** in the city.	Я був у Нью Йорку вперше і тільки через декілька днів почав орієнтуватися в місті.

1. У лондонському метро не важко заблукати. 2. Хоча він і був фахівцем з автомобілів, він не відразу збагнув, що до чого, коли побачив новий транспортний засіб. 3. Студентам потрібен час, щоб звикнути до нового університетського середовища. 4. В темряві важко орієнтуватись. 5. Компас допоможе вам знайти дорогу.

VOCABULARY

8.3. Find the translation of the following word combinations in the text:

електричні завади; під'єднатись до мережі; низькочастотні хвилі; вбудований компас; перелітні птахи; впливати на навігаційну систему; змушений переключатись; видатний подвиг; не відхилятись від курсу.

8.4. Find in the text synonyms to the following words. Add more synonyms if possible.

Research, internal, a magazine, an apparatus, to ruin, embedded, to intervene (with), wonderful, special.

GRAMMAR FOCUS

8.5. Put the words in the correct order to make a sentence.

1. systems, of, the, German, navigational, electromagnetic, on, influence, researchers, fields, study, birds'. 2. by, compass, magnetic, the, sense, built-in, of, Birds, a, field, Earth. 3. birds, can, Low, of, frequency, disrupt, some, waves, migration. 4. find, electromagnetic, birds, In, bearings, absence, of, easily, noise, their. 5. fly, areas, when, Birds', mostly, over, navigational, urban, is, system, affected, they. 6. in, journal, scientists, study, the, published, The, their, Nature.

FOLLOW UP

8.6. Find information on navigation instruments and devices and make a short report.

UNIT 9. ONE YEAR ON MARS: THE CURIOSITY ROVER

PRE-READING

Mention 5 facts you know about Mars.

ACTIVE VOCABULARY

jet propulsion	реактивний рух	to unfold	розкривати(сь)
to erupt	вивергатись	favorable	сприятливий
hug	обійми	streambed	русло
relief	полегшення	significant	істотний, значний
considerable	значний	a target	ціль

READING

9.1. Read the text and say whether the statements are TRUE or FALSE. If FALSE, give the correct answer.

At approximately 1:30 am East Coast time on August 5, 2012, the control room at the Jet Propulsion Laboratory in Pasadena, California, erupted with cheers, high

fives, hugs, relief, and, yes, tears. The Curiosity rover, which **had taken several years to** be built and another year to travel away from Earth, had landed safely on the surface of Mars. Millions of people were watching the landing on TV, through NASA's live stream. NASA had chosen, at considerable risk, to make Curiosity's landing on Mars an event, a spectacle, a drama that unfolded in nearly real time: one small step for a robot, one giant leap for robotkind.

Since its landing, Curiosity has been working to explore the surface of Mars. It has already made discoveries that show the existence of favourable conditions for microbial life billions of years ago, including evidence of an ancient streambed. It's also made significant measurements of the dangerous levels of radioactivity, which will help designers prepare for future manned missions to Mars. By the numbers: Curiosity has sent us more than 190 gigabits of data, returned more than 72,000 images, and fired more than 75,000 laser shots to investigate the composition of targets. The rover is now making its way to the base of Mount Sharp, where it will investigate lower layers of a mountain that rises three miles from the floor of Gale Crater.

1. Curiosity brought people to Mars. 2. There is water on Mars. 3. People in the control room were happy. 4. It took one year for the spaceship to travel from Earth to Mars. 5. Curiosity has found ancient microbes on Mars. 6. The rover is studying what the surface of Mars looks like and is made of. 7. NASA showed the landing of the rover several days after the event because they were afraid that something might go wrong. 8. It was night in California when the rover landed on Mars. 9. The distance between Mount Sharp and Gale Crater is three miles. 10. The radioactivity on Mars is really high.

9.2. Choose one of the options based on the information from the text.

1. People in the control room cried because ___.

a) they saw extraterrestrial creatures b) the mission to Mars ended c) the spacecraft crashed d) the rover arrived on Mars

2. The spaceship with the rover on board was travelling to Mars ___.

a) four months b) a year c) 2 years d) a year and a half

3. The landing was transmitted live through the ___.

a) radio b) Internet c) television d) telephone

4. The rover has found that billions years ago there were ___ on Mars.

a) people b) insects c) suitable environment for microbes d) microbes

5. The rover made laser shots ___.

a) to make photos b) to investigate the structure of objects on Mars c) to transmit information d) to fight with aliens

6. a) There are rivers on Mars. b) There may have been rivers on Mars. c) There are no rivers on Mars. d) The rover found nothing connected with water on Mars.

7. One of the rover's tasks is to ___.

a) study the lower part of one of the mountains b) climb the mountain c) dig through the mountain d) photograph all mountains on Mars

SPEECH PATTERNS

9.3. Analyse the speech pattern and translate the sentences using the pattern.

it takes (smb.) ... to do smth.	1) займає (про час) 2) потрібно (про інші ресурси)
It took about 20 years to build each of Egyptian pyramids.	Будівництво кожної з Єгипетських пірамід займало приблизно 20 років.
It takes 17 trees to produce a ton of paper.	Потрібно 17 дерев, щоб виготовити тонну паперу.

1. Потрібно всього декілька годин, щоб повністю зарядити електричний автомобіль. 2. Скільки потрібно часу, щоб долетіти до Марса? 3. Потрібно приблизно 2 роки, щоб навчитись говорити, і майже все життя, щоб навчитись не говорити. 4. Іноді потрібно так мало, щоб зробити людину щасливою. 5. Треба багато практики, щоб стати кваліфікованим програмістом.

VOCABULARY

9.4. Match adjectives with appropriate nouns. Translate the collocations.

1	manned	a	shot
2	microbial	b	stream
3	control	c	mission
4	laser	d	conditions
5	live	e	five
6	high	f	life
7	favourable	g	room

9.5. Give synonyms to the following words from the text.

Approximately; several; to build; considerable; small; giant; to explore; favourable; evidence; dangerous; composition.

GRAMMAR FOCUS

9.6. Make sentences Passive if possible. Note: *Electric current produces a magnetic field. – A magnetic field is produced by electric current.*

1. Engineers have been constructing Curiosity rover for several years. 2. The rover landed on Mars on August 5, 2012. 3. Millions of people were watching the landing on TV. 4. NASA showed the Curiosity's landing in nearly real time. 5. Curiosity rover has been working on the surface of Mars. 6. It has discovered an ancient streambed on Mars. 7. The robot is measuring the levels of radioactivity on the surface of Mars. 8. Curiosity has sent us gigabits of data and thousands of photos.

FOLLOW UP

9.7. Find more information on the Curiosity rover and make a short report.

UNIT 10. GEOENGINEERS ARE GOING TO COOL THE PLANET

PRE-READING

If you are not a geoengineer, give your ideas on what a geoengineer might do or investigate.

ACTIVE VOCABULARY

disaster	катастрофа	to pull off	упоратись, домогтись
to reflect	віддзеркалювати	an attempt	спроба, намагання
to replicate	копіювати	nonetheless	тим не менше
to release	звільняти, випускати	controversial	суперечливий
an effect	дія, вплив		

READING

10.1. Read the text and answer the questions.

Even if they can be a major disaster for people nearby them, volcanoes do one good thing: helping to cool the planet by sending sun-reflecting chemicals into the stratosphere. Now two Harvard engineers are trying to replicate the better part of the

volcanic process on a small scale by spraying thousands of tons of sulphate aerosols into the atmosphere above New Mexico.

Within a year, the researchers, David Keith (who manages a multimillion dollar geoengineering research fund from Bill Gates) and James Anderson, will release the chemicals from a balloon 80,000 feet above Fort Sumner, then measure the effects on the ozone's chemistry. (To answer the big question: no, this can't be pulled off in a lab.) This will be a test, not a full-on attempt to stop climate change, the researchers say, and it won't have any major effects on the environment.

Nonetheless, geoengineering strategies like this are controversial, **to say the least**.

1. What good thing can volcanoes do? 2. What chemicals are Harvard engineers going to spray? 3. Where are they going to release the chemicals? 4. What are the engineers going to test? 5. Who is the sponsor of this project? 6. Why cannot this experiment be made in the laboratory?

10.2. Put the sentences in the correct order.

1. The engineers spray the chemicals above New Mexico. 2. The researchers fill the balloon with hot air. 3. The engineers decided to reproduce the cooling effect of volcanoes in an experiment. 4. Engineers analyse the chemistry of the ozone layer after spraying the chemicals. 5. Engineers make tons of sulphate aerosols. 6. Bill Gates funded the research.

SPEECH PATTERNS

10.3. Analyse the speech pattern and translate the sentences using the pattern.

to say the least	м'яко кажучи, щонайменше
He behaved unreasonably, to say the least.	Він поводився, м'яко кажучи, нерозумно.

1. Футболісти грали, м'яко кажучи, не в повну силу. 2. Він повинен щонайменше вибачитись за свої слова. 3. Погода була, м'яко кажучи, несприятливою. 4. Він приклав для цього без перебільшення титанічні зусилля. 5. М'яко кажучи, їжа була несмачною.

VOCABULARY

10.4. Fill in the gaps with one of the words: *measure, pull off, environment, attempts, reflect, controversial, research, effect.*

1. Rainbows appear when raindrops (like a prism) ___ sunlight. 2. Many graduate students are involved in scientific ___. 3. Antibiotics have no ___ on viruses. 4. Their evidence of the accident was often ___. 5. How did you ___ your driving test? 6. All his ___ to improve the situation have failed. 7. Thermometers are designed to ___ temperature. 8. Children need favourable ___ to develop.

10.5. Match each word on the left with its synonym and antonym on the right. Find more synonyms and antonyms if possible.

major	a scientist	a surrender
to cool	tiny	to fail
to send	a reply	to launch
small	large-scale	a layman
a researcher	to achieve	to warm
an answer	to end up	undisputed
to pull off	to direct	to receive
an attempt	to chill	minor
to stop	dubious	a question
controversial	an endeavour	big

GRAMMAR FOCUS

10.6. Write down from the text all combinations of *Noun + Preposition + Noun* and *Verb + Preposition + Noun*. Compose sentences of your own using these collocations.

Noun + Preposition + Noun	Verb + Preposition + Noun
disaster for people	to cool smth. by sending

FOLLOW UP

10.7. Find some information about similar experiments that cannot be completed in the laboratory.

UNIT 11. HANDS-FREE ON THE ROAD?

PRE-READING

Think of pros and cons of fully automatic cars. In your group, compare opinions of those who can drive and those who can't.

ACTIVE VOCABULARY

to launch	стартувати, починати	purpose	мета
a vehicle	транспортний засіб	ultimate	остаточний, кінцевий
relatively	відносно	to get rid of smth.	позбавитись чогось
freeway	автострада	steering wheel	кермо
complicated	складний	pilot scheme	експериментальний проект
urban	міський	major	головний
fleet	парк (автомобілів)	manufacturer	виробник

READING

11.1. Read the text and say whether the statements are TRUE or FALSE. If FALSE, give the correct answer.

Google's driverless car project was officially launched in 2010. Since then it says its test vehicles have completed more than a million kilometres on public roads. They've progressed from relatively simple driving on the Californian freeway to more complicated manoeuvering in urban areas.

So far, Google has used a fleet of ordinary cars, which have been converted to carry self-driving technology. But now it wants to take the process a stage further by producing a purpose-built machine. It's planning to create a fleet of about a hundred fully autonomous electric vehicles capable of carrying two people at up to 40 km per hour without any input from a human driver.

The ultimate aim is to get rid of the controls altogether, although early versions will still need to have a steering wheel and pedals.

Google believes it will be able to launch a pilot scheme using the new cars within the next two years. But the internet giant **is far from being** the only company

working on self-driving technology. A number of major manufacturers have their own test programmes, among them Ford, Toyota, Volkswagen and BMW.

1. Google is the only company that wants to create a driverless car. 2. Google has completed the project. 3. Google tested its driverless cars both in and out of the city. 4. Google wants its driverless cars to be controlled automatically. 5. Google's test cars have run only 40 km. 6. Google will invite pilots to drive the test cars. 7. At the first stage, usual cars were used supplied with the new driving technology. 8. Google is going to apply the technology to construct self-driving trucks. 9. The cars will be high-speed vehicles. 10. The cars have been tested for less than two years.

11.2. Complete the sentences.

1. In 2010 Google started a project aimed at creation of ____. 2. Test vehicles have already run ___. 3. The cars drive not only on the Californian freeway, but also ___. 4. Google has converted ___ into ___. 5. Google is planning to create a fleet of ___ vehicles. 6. The car will carry ___ and will drive at a speed of ___. 7. The ultimate aim of the project is ___. 8. Self-driving vehicles are also created by ___.

SPEECH PATTERNS

11.3. Analyse the speech pattern and translate the sentences into English using the pattern.

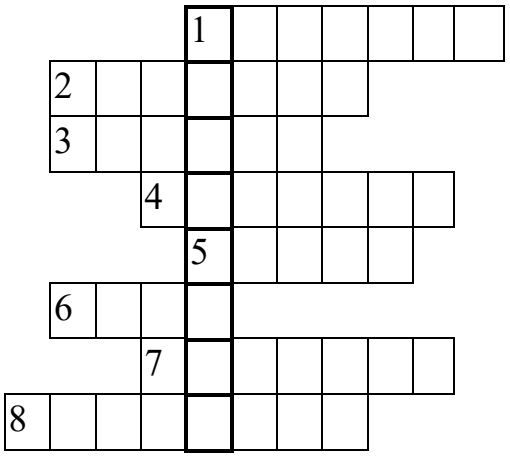
to be far from smth. *or* **far from being smth.**	**зовсім (не), далеко (не)**
He was far from disappointed when he heard the news.	Він зовсім не розчарувався, коли почув новину.

1. Ви мене неправильно зрозуміли, я зовсім не це мав на увазі. 2. Електростанції на відновлюваних джерелах енергії ще не досить ефективні. 3. Покриття металів лаками та фарбами – далеко не єдиний спосіб захисту від корозії. 4. Сплави з пам'яттю форми ще не повністю досліджені. 5. Таке враження, що він зовсім не розуміє небезпеки цієї подорожі.

VOCABULARY

11.4. Complete the sentences with the words from the text (in the box), write them down into the puzzle and in the selected column you will read what figure decorates Google's campus.

control	driving	steering	launch	vehicle	purpose	since	urban



1. If you apply for a ___ license, you have to satisfy driver requirements. 2. Google is investing in Tesla Motors to create a 265-mile (426 km) range battery electric ___. 3. *See (5)*. 4. The first remote ___ for a television was developed by Zenith Radio Corporation in 1950 and was called "Lazy Bones". 5. ___ it's __(3)__ in 1998, Google has become the most popular search engine in the world. 6. The ___ population in Ukraine significantly outnumbers the rural one: 67.2% versus 32.8% respectively. 7. The ___ of the Project Glass supported by Google is to develop an augmented reality head-mounted display. 8. The first automobiles were controlled with a tiller, but in 1894, Alfred Vacheron took part in the Paris-Rouen race with a Panhard 4 hp model which he had fitted with a ___ wheel.

11.5. Give synonyms and antonyms to the following words from the text.

Word	Synonym(s)	Antonym(s)
to launch		
public		
to progress		
simple		
urban		
ordinary		
to create		
autonomous		
new		
next		
a giant		
major		

GRAMMAR FOCUS

11.6. Put questions to the following statements in writing.

1. Google launched the driverless car project in 2010. (When?) 2. The vehicles were driving on the Californian freeway. (Where?) 3. Google converts ordinary cars into self-driving vehicles. (What cars?) 4. Google is going to create a fleet of about a hundred fully autonomous electric vehicles. (How many vehicles?) 5. The vehicle will drive at a speed of 40 km per hour. (What speed?) 6. Early versions of the car will have a steering wheel and pedals. (Why?) 7. Google will be able to launch a pilot project within two years. (*a general question*) 8. Some automobile companies also have their test programmes on creating self-driving cars. (Who?)

FOLLOW UP

11.7. Find materials on other companies creating driverless cars and make a short report.

UNIT 12. WORLD'S BLACKEST MATERIAL

PRE-READING

How many colours do you know? Write them down. Compare your lists with your peers and add more colour names in yours.

ACTIVE VOCABULARY

alien	чужий, позаземний	an abyss	безодня
to absorb	поглинати	a limb	кінцівка
to stare	пильно дивитись	incorporeally	безплотно, нематеріально
coating	покриття	actual	дійсний
apparent	очевидний	unless = if (not)	якщо (з запереченням)

READING

12.1. Read the text and complete the sentences.

A British company has produced a "strange, alien" material so black that it absorbs **all but** 0.035 per cent of visual light, setting a new world record. To stare at the "super black" coating made of carbon nanotubes – each 10,000 times thinner than a human hair – is an odd experience. It is so dark that the human eye cannot

understand what it is seeing. Shapes and contours are lost, leaving **nothing but** an apparent abyss.

If it was used to make one of Chanel's little black dresses, the wearer's head and limbs might appear to float incorporeally around a dress-shaped hole.

Actual applications are more serious, enabling astronomical cameras, telescopes and infrared scanning systems to function more effectively. Then there are the military uses that the material's maker, Surrey NanoSystems, has not allowed to discuss.

Stephen Westland, professor of colour science and technology at Leeds University, said traditional black was actually a colour of light and scientists were now pushing it to something out of this world.

"Many people think black is the absence of light. I totally disagree with that. Unless you are looking at a black hole, nobody has actually seen something which has no light," he said. "These new materials almost as close to a black hole as we could imagine."

1. A British company has manufactured ___. 2. The material is so black that ___. 3. The coating is made of ___. 4. Each nanotube is ___. 5. The invention can be applied in ___. 6. Stephen Westland is a ___. 7. He says that traditional black is actually ___. 8. Unless we are looking at a black hole, we cannot ___. 9. The new material is almost ___. 10. The maker of the material is ___.

SPEECH PATTERNS

12.2. Analyse the speech pattern and translate the sentences into English using the pattern.

all but	майже, приблизно
These batteries are all but dead.	Ці батареї майже зовсім розрядились.
nothing but	нічого крім, тільки
As an exam approaches, some students usually do nothing but study every waking hour.	Коли наближається екзамен, студенти звичайно тільки і роблять, що вчаться, коли не сплять.

1. Ця стародавня мова майже зовсім забута. 2. В суді люди присягають казати нічого крім правди. 3. Астрономи з'ясували, що деякі зірки створені виключно з

металу. 4. Після фільтрування вода стала майже чистою. 5. Майже 8 відсотків електроенергії в Німеччині виробляється вітровими електростанціями.

VOCABULARY

12.3. Match objects mentioned in the text with their attributes. For each object think of a new attribute(s), and for each attribute think of a possible object(s).

1	visual	a	coating
2	human	b	material
3	British	c	record
4	astronomical	d	nanotube
5	black	e	system
6	alien	f	company
7	world	g	eye
8	super black	h	hole
9	infrared scanning	i	light
10	carbon	j	camera

GRAMMAR FOCUS

12.4. Put all the verbs of the texts in two columns: transitive verbs (having a direct object) and intransitive verbs (having no object). Compose sentences of your own with these verbs in writing.

Transitive verbs	Intransitive verbs
to produce (material)	to function

12.5. Give short forms of agreement or disagreement to the statements, e.g.: *1. The sky is blue. – Yes, it is. 2. We study French. – No, we don't. 3. The light isn't a wave. – Yes, it is.*

1. A British company has produced a black hole. 2. The new material is white. 3. The new material absorbs all visual light. 4. The nanotubes are made of carbon. 5. The nanotubes are thicker than a human hair. 6. The human eye cannot distinguish the shape when looking at this material. 7. The company Surrey NanoSystems created the technology for painters. 8. The military asked the company not to reveal all the secrets of the material. 9. Traditional black is not the colour of light. 10. Nobody has seen something which has no light.

PRACTICE

12.6. The English often use the colour names to indicate something different than just colours. Read the sentences with the colour idioms. Try to explain their meaning in other words and find similar expressions in your native language.

1. Don't take the world as straightforward; everything is not just **black and white**. 2. John has decided to quit his job in a profitable company **out of the blue** and moved to a small village. 3. What's the matter with Susan today? She seems really **blue**. 4. During the crisis a lot of **blue-collar** workers were fired. 5. William didn't do well during the term but he passed his exams **with flying colours**. 6. We have been **given the green light** to launch the experiments. 7. My aunt has **a greed thumb**. Her garden is always so beautiful. 8. They gave me my **pink slip** last week, so I've got to find a new job now. 9. We always give our foreign partners **a red-carpet treatment**. 10. Our record played has become **a white elephant** now. It is gathering dust in the closet. 11. This company has a lot of vacancies for **white collars**.

FOLLOW UP

12.7. Find some facts on the applications of colour science and technology and make a short report.

UNIT 13. WHO INVENTED MAGNETS?

PRE-READING

Magnets are widely used both in technology and households. Write down 3 applications of magnets in everyday life, in industry or research. Discuss your lists with your peers.

ACTIVE VOCABULARY

to occur	зустрічатись	dense	щільний; густий
to consider	вважати	existence	існування
a shepherd	пастух	to introduce	впроваджувати
nail	цвях	thus	так, таким чином
to stick (stuck)	приклеюватись	head start	перевага, фора
alternate	інший; протилежний	lodestone = loadstone	магнетит
to invade	вторгатись		

READING

13.1. Read the text and complete the sentences.

The first magnets were not invented, but rather were found from a naturally occurring mineral called magnetite. Traditionally, the ancient Greeks were considered the discoverers of magnetite. There is a story about a shepherd named Magnes whose shoe nails stuck to a rock containing magnetite. There is an alternate story about a region of Macedonia called Magnesia as the starting point.

The mineral magnetite is an iron oxide that is easily magnetized when it forms. Magnetite is also known as Lodestone.

Magnetite occurs all over the world, but there are especially large deposits in Scandinavia. The Vikings invented the first practical magnetic compass and used it extensively in their travels to colonize or in war. This enabled them to cross oceans to reach the new world and to invade England **at will**, even in the dense fog. The Vikings kept the existence of the magnetic compass a secret. The Chinese also invented the magnetic compass, probably earlier than the Vikings. After commercial trade with China was started by the Italians, especially after Marco Polo's trip, the magnetic compass was introduced to the rest of Europe. This made possible the exploration of the oceans by the Europeans, although the Norsemen had a monopoly for almost 500 years and thus a big head start. Today all ships large and small use magnetic compasses to navigate.

1. Magnetite is a ___ mineral. 2. Large deposits of magnetite can be found in ___. 3. Vikings were the first Europeans to invent ____. 4. They crossed the oceans to ___. 5. The magnetic compass was introduced to other Europe after ___. 6. The other name for magnetite is ___.

13.2. Say whether the statements are TRUE or FALSE. If FALSE, give the correct answer.

1. The first compass was created by the Chinese. 2. The ancient Greeks invented magnet. 3. Marco Polo sailed to China. 4. Vikings used the compass to get to America. 5. Vikings always lost their way in the thick fog. 6. Magnetite can be found in any place of the world. 7. The compass was invented 500 years ago. 8. Lodestone is another name for magnet. 9. The origin of the word magnet is known exactly. 10. Immediately after inventing the compass, Vikings sold the technology to the Italians.

SPEECH PATTERNS

13.3. Analyse the speech pattern and translate the sentences into English using the pattern.

at will	**за бажанням, коли потрібно**
You may use my dictionaries **at will**.	Ви можете користуватись моїми словниками, коли забажаєте.

1. Новий гелевий матеріал може за необхідності змінювати свої властивості. 2. За бажанням ви можете змінювати конфігурацію вашого комп'ютера. 3. При дистанційному навчанні ви можете самі обирати час та інтенсивність занять. 4. Вона така професійна актриса, що може сміятись чи плакати, коли це потрібно. 5. Протягом занять не можна входити в аудиторію чи виходити, коли вам заманеться.

VOCABULARY

13.4. Find matching words and use the obtained word combinations in the sentences of your own.

1	shoe	a	compass
2	starting	b	start
3	dense	c	nail
4	magnetic	d	fog
5	head	e	Greeks
6	ancient	f	point

13.5. Choose one of the options to fill in the gaps.

1. Prior to driving, ensure that you can ___ your vehicle's brake and gas pedals.
a) rich b) ridge c) reach d) bridge
2. The first personal computers were ___ in the late 1970s.
a) introduced b) found c) discovered d) invaded
3. Less heat would give plants a significant ___ start to spread their seed.
a) false b) hand c) foot d) head
4. Some photos and traces are considered the evidence for the ___ of a Bigfoot.
a) explanation b) extinction c) existence d) exploration
5. An early prototype of the alarm clock was ___ by the Greeks around 250 BC.
a) invented b) discovered c) germinated d) accommodated

6. Bauxite ___ 15-25 percent aluminium.
a) controls b) contracts c) contains d) consists
7. Metals rarely ___ in nature in their pure metallic state.
a) find b) live c) occupy d) occur
8. Osmium and Iridium are the two most ___ elements in pure form.
a) dry b) dense c) rare d) magnetic

GRAMMAR FOCUS

13.6. Paraphrase the sentences using the verb *to be* in different functions and tenses. Example: *Magnetite occurs naturally. – Magnetite is a naturally occurring mineral.*

1. Many people think that ancient Greeks invented compass. 2. There exists a story about a shepherd Magnes who found magnetite. 3. The Vikings invented the first practical magnetic compass. 4. Vikings invaded England. 5. Vikings kept the existence of the magnetic compass a secret. 6. Italy started commercial trade with China after Marco Polo's trip. 7. Magnetic compass made the exploration of oceans possible. 8. Today all ships use magnetic compasses. 9. Magnetite has another name – Lodestone.

FOLLOW UP

13.7. Prepare a short report on ancient inventions still used today.

UNIT 14. AT THE CENTRE OF TIME

PRE-READING

What is a standard? Why do we need them? What would happens if there were no standards or the standards were not met? Give 3 examples of standards used in your field of studies or work.

ACTIVE VOCABULARY

longitude	довгота	to split	ділити, відділяти
arbitrary	випадковий, довільний	rapid	швидкий
a stroke	лінія, штрих	expansion	розповсюдження
to bisect	ділити навпіл	to abstain	утримуватись

READING

14.1. Read the text and complete the sentences.

At longitude 0° 0' 00", the arbitrary stroke on our maps that passes from pole to pole and bisects the UK, France, Spain, Algeria, Mali, Burkina Faso and Ghana divides the Earth into east and west, just as the Equator splits it into north and south.

This imaginary line, now known as the Greenwich Prime Meridian, not only allows us to navigate the globe but also keeps the world ticking to the same symbolic 24-hour clock.

But it has not always been so.

Until the 19th Century, many countries and even individual towns kept their own local time based on the sun's passage across the sky and there were no international rules governing when the day would start or finish.

However, with the rapid expansion of the railways and communications networks during the 1850s and 1860s, setting a standard global time soon became essential.

And so, in 1884, 41 delegates from 25 nations gathered in Washington in the US for the International Meridian Conference to decide from where time and space should be measured.

By the end of the difficult summit Greenwich had won the prize of longitude 0º by a vote of 22 to one, **with** only San Domingo against and **France and Brazil abstaining**.

The meeting also agreed Greenwich Mean Time (GMT) would be used as the standard for the world, **with the day beginning** at midnight at Greenwich and **counted** on a 24-hour clock.

NB: 0° 0' 00" is pronounced *zero degrees zero minutes zero seconds*.

1. Zero meridian crosses such countries as ___. 2. The equator splits ___. 3. Greenwich Prime meridian is a(n) ___. 4. Many countries used to keep their own time according to ___. 5. Setting a standard global time became essential due to ___. 6. In 1884, the delegates from ___ gathered in ___ for the International Meridian Conference. 7. The summit made a decision that ___. 8. Greenwich Mean Time is a standard which determines that ___.

SPEECH PATTERNS

14.2. Analyse the pattern and translate the sentences into English using the pattern.

..., with <Subject> + V-ing (V-III)	..., причому; а; та
Greenwich had won the prize of longitude 0º by a vote of 22 to one, **with** only San Domingo against and **France and Brazil abstaining**.	Гринвіч виграв право вважатися довготою 0º з рахунком 22 до одного, причому проти була тільки Сан Домінго, а Франція та Бразилія утримались.

1. Томас Едісон був надзвичайно успішним винахідником, а кількість його патентів перевищила 1000. 2. При великих швидкостях обертання підшипник нагрівається, а масло виконує функцію охолодження. 3. Архімед був видатним математиком, фізиком, винахідником, і багато з його механізмів й досі використовуються в техніці. 4. Спечені деталі є досить зносостійкими, і ця властивість забезпечує їх надійне використання в машинах. 5. Рентгенівські промені, як і світло, – це електромагнітне випромінювання, але довжина хвилі Х-променів в тисячі разів коротша, ніж у світла – від 10^{-12} до 10^{-5} см. 6. Існує спеціальний розділ науки – волоконна оптика, і її досягнення застосовуються майже в усіх галузях техніки та наукових досліджень.

VOCABULARY

14.3. Write down as many derivatives of the following words as possible.

Verb	**Noun**	**Adjective**
to pass	*passage; passer(-by); passport; password*	*passable; passing*
to divide		
to split		
		imaginary
to know		
to navigate		
	globe	
		symbolic
	century	
		local
	rule	

Verb	Noun	Adjective
to govern		
	expansion	
		essential
to decide		
to measure		
to agree		
to count		

14.4. Give the English equivalents to the following expressions:
середній час; уявна лінія; ділити Землю на схід та захід; рухатись по земній кулі; виграти приз голосуванням 22 до 1; починатись о півночі; рахувати час за годинником; швидке розповсюдження; проходити по небу.

GRAMMAR FOCUS

14.5. Make the following statements negative and then give the correct statement. Example: *The sun rises in the west. – The sun does not rise in the west. The sun rises in the east.*

1. A meridian goes along the equator. 2. The Prime meridian crosses Ukraine. 3. Greenwich is in Greenland. 4. Greenwich Prime Meridian sets the longitude 1° 1' 11". 5. Each country has its own Prime meridian. 6. The day begins at noon in Japan. 7. Greenwich Prime Meridian allows us to navigate in space. 8. The equator bisects the Earth into east and west. 9. International Meridian Conference was held in London.

PRACTICE

14.6. Use the following phrases: *stands for, means, is deciphered as, is transcribed as* to decipher abbreviations. For example: *GMT stands for Greenwich Mean Time.* Write 5 abbreviations from your field of study or work and transcribe them.

FOLLOW UP

14.7. Find information on other International agreements on standardisation and make a short report.

UNIT 15. WHAT ARE UFOS?

PRE-READING

Do you believe our planet is attended by aliens? Give your reasons why.

ACTIVE VOCABULARY

to coin	створювати нові слова	to reveal	виявляти
a catchall term	всеосяжний термін	ignition	загоряння
an alien	іншопланетянин	to disintegrate	розпадатися
late	покійний	debris ['de(i)bri:]	уламки, сміття
perception	сприйняття	controversy	протиріччя
conventional	традиційний	overwhelming	переважний
a scrutiny	ретельне дослідження	elsewhere	десь в іншому місці
available	наявний	to abduct	викрадати
common sense	здоровий глузд	a hoax	розіграш

READING

15.1. Read the text and complete the sentences.

At around the middle of the 20th century, the U.S. Air Force coined the phrase "UFO" as a catchall term for any "unidentified flying object" – unknown lights and discs spotted in the sky. But among ufologists (UFO enthusiasts and researchers), the term has become synonymous with alien spacecraft.

The late astronomer J. Allen Hynek defined a UFO as "the reported perception of an object or light seen in the sky or upon the land the appearance, trajectory, and general dynamic and luminescent behaviour of which do not suggest a logical, conventional explanation and which is not only mystifying to the original percipients but remains unidentified after close scrutiny of all available evidence by persons who are technically capable of making a common sense identification, if one is possible".

UFOs are **more often than not** revealed to be something very well known – a weather balloon or airplane lights, for example. But in anywhere from 5 to 10 percent of UFO cases, the object remains a mystery.

During a UFO sighting, strange phenomena are often reported, such as radio and TV interference or car-ignition failure. Many UFOs leave strange calling cards, such

as indentations in the ground; burned or flattened vegetation; spider-web-like strings that hang from telephone poles and trees and disintegrate at the touch; and chunks of unidentifiable debris.

So, are they really alien spacecraft piloted by extraterrestrial beings, or are they terrestrial objects that just haven't been properly identified? The question has raised a good bit of controversy, confronting those who believe in UFOs with those who say they need to see more scientific UFO evidence.

Surveys show that the overwhelming majority of Americans believe that intelligent life exists elsewhere in the universe. More than 60 percent of respondents to a 1997 CNN poll said they believed aliens had contacted humans; approximately 50 percent said they thought aliens had abducted humans; and 80 percent believed the government was hiding something about alien contact.

People who claim to have seen UFOs are confident that what they've seen is real. They say these alien beings have come to Earth to study the human race, create a new hybrid species or simply to communicate with humans.

But sceptics say there is a startling lack of real scientific evidence to prove – or disprove – the UFO phenomenon. They argue that the majority of UFOs turn out to be identifiable phenomena – everything from weather balloons and meteor showers to hoaxes.

1. UFO stands for ___. 2. People who study UFOs are called ___. 3. The appearance of a UFO may cause some strange phenomena as ___. 4. Many UFOs leave some strange traces, for example ___. 5. Most Americans believe that ___. 6. The aliens may have come to Earth in order to ___. 7. In most cases UFOs may simply turn out to be ___. 8. As for me, I think that ___.

SPEECH PATTERNS

15.2. Analyse the speech pattern and translate the sentences into English using the pattern.

more often than not	скоріш за все, часто
During foggy weather the trains are late more often than not.	В туманну погоду поїзди, як правило, спізнюються.

1. У вищій математиці часто використовуються грецькі літери. 2. Частіше за все ліфти у цьому будинку не працюють. 3. Найчастіше знання іноземної мови є

обов'язковим, щоб отримати роботу в комп'ютерній фірмі. 4. Частіше за все ми не знаємо, що може трапитись наступної миті. 5. Комп'ютери майже завжди поставляються з встановленою операційною системою.

VOCABULARY

15.3. Make negative of each base word using the prefixes. Consult your dictionary. Base words: *connect, honest, stable, possible, fortune, organic, legal, mobile, necessary, order, pronounce, logic, definite, appear, probable, predictable, literate, pleasant, polite, understand, secure.*

Prefix	**Base word**
un	known
in	
im	
il	
dis	
mis	

15.4. The underlined fragments in the text signal giving examples. Use these patterns to extend the following sentences with examples. For more information on practicing giving examples see also Appendix 1.

1. Quantum field theory provides evidence that all elementary particles have antiparticles. 2. Pewter is an alloy of tin and another metal. 3. Precious metals are rust-proof. 4. Google produces software not only for searching information but lots more. 5. Top universities in the United States offer students distance learning courses in various disciplines. 6. Some programming languages were written in English by non-native speakers. 7. Walk through your house and you will find electric motors everywhere. 8. Light emitting diodes can be found in all kinds of devices. 9. Technological innovations may bring about unintended consequences. 10. The use of clean alternative energies will help ensure man's survival into the 21st century and beyond.

PRACTICE

15.5. Give explanations to the following words from the text: *species, alien, percent, spacecraft, evidence, luminescent, phenomenon*. Fill in the gaps in the sentences with these words.

1. The fastest ___ ever launched reached a breakneck speed of 44 miles per second! They were the 1974/76 Helios solar probes. 2. Dancing northern lights is a unique natural ___ that always causes excitement and wonder among those who have never seen it before. 3. A new home lighting system runs on ___ bacteria that eat waste. 4. Our galaxy may contain over 50 billion ___ worlds, according to calculations. 5. The Common Poorwill (козодой звичайний) is the only known bird ___ to hibernate. It hibernates for up to five months. 6. Just 6.5 ___ of all people ever born are alive today. 7. Mars rover Curiosity has discovered extensive ___ that water once flowed over the surface of the Red Planet.

GRAMMAR FOCUS

15.6. Put a question tag at the end of the sentence. Examples: *He is a physicist, isn't he? He works at the University, doesn't he? His children do not study at the University, do they?*

1. The term "UFO" was coined in the middle of the 20th century, ___? 2. By "UFO" ufologists mean an alien spacecraft, ___? 3. People do not know exactly what a UFO is, ___? 4. Very often a UFO is something very well known, ___? 5. During a UFO appearance, some strange phenomena are often observed, ___? 6. Most people believe that there is an intelligent extraterrestrial life elsewhere, ___? 7. Maybe, aliens have come to the earth once, ___? 8. The problem seems to be unsolved yet, ___?

FOLLOW UP

15.7. Imagine you have seen a UFO. Write a short report (up to 10 sentences) about it mentioning the size, the speed, the time of appearance, light effects and the consequences.

UNIT 16. WHAT IS A LIGHT YEAR?

PRE-READING

Write down at least three physical quantities and their units of measurement. Formulate the results as follows: *Distance is measured in metres, centimetres, kilometres etc.*

ACTIVE VOCABULARY

measuring	вимірювання	a digit	цифра
a unit	одиниця	to determine	визначати
an increment	крок; величина, що додається	an explosion	вибух

READING

16.1. Read the text and answer the questions.

A light year is a way of measuring distance. That **doesn't make much sense** because "light year" contains the word "year," which is normally a unit of time. Even so, light years measure distance.

You **are used to measuring** distances in either inches / feet / miles or centimetres / metres / kilometres, depending on where you live. You know how long a foot or a metre is – you are comfortable with these units because you **use** them every day. Same thing with miles and kilometres – these are nice, human increments of distance.

When astronomers use their telescopes to look at stars, things are different. The distances are gigantic. For example, the closest star to Earth (besides our Sun) is something like 24,000,000,000,000 miles (38,000,000,000,000 kilometres) away. That's the closest star. There are stars that are billions of times farther away than that. When you start talking about those kinds of distances, a mile or kilometre just isn't a practical unit to use because the numbers get too big. No one wants to write or talk about numbers that have 20 digits in them!

So to measure really long distances, people use a unit called a light year. Light travels at 186,000 miles per second (300,000 kilometres per second). Therefore, a light second is 186,000 miles (300,000 kilometres). A light year is the distance that light can travel in a year, or: 186,000 miles/second * 60 seconds/minute * 60 minutes/hour * 24 hours/day * 365 days/year = 5,865,696,000,000 miles/year.

That's a long way!

Using a light year as a distance measurement has another advantage – it helps you determine age. Let's say that a star is 1 million light years away. The light from that star has traveled at the speed of light to reach us. Therefore, it has taken the star's light 1 million years to get here, and the light we are seeing was created 1 million years ago. So the star we are seeing is really how the star looked a million years ago, not how it looks today. In the same way, our sun is 8 or so light minutes away. If the sun were to suddenly explode right now, we wouldn't know about it for eight minutes because that is how long it would take for the light of the explosion to get here.

1. What does a light year measure? 2. In what units do people usually measure distance? 3. How far from the Earth is the nearest star (not our Sun)? 4. How fast does the light travel? 5. What is a light year? 6. How much (approximately) is a light year? 7. What else can be measured with the help of light years?

SPEECH PATTERNS

16.2. Analyse the speech pattern and translate the sentences into English using the pattern.

it doesn't make sense (it makes no sense)	не має сенсу; не зрозуміло
His apologies make no sense. She won't forgive him.	Його вибачення марні. Вона не пробачить його.

1. Його відношення до товариша важко зрозуміти. 2. Будувати сонячні батареї у північних регіонах не має великого сенсу. 3. Не варто купувати застарілу оргтехніку. 4. Не треба друкувати всі фотографії, які ви зняли своїм смартфоном. 5. Марно намагатися побачити цю зірку неозброєним оком.

VOCABULARY

16.3. Choose one of the options to fill in the gaps.

1. To look at stars astronomers use ___.

a) microscopes b) spectacles c) telescopes

2. The closest star is $38*10^{12}$ ___ away.

a) miles b) kilometres c) meters

3. Numbers are composed of ___.

a) digits b) units c) characters

4. Measuring distance with a light year helps also to determine the ___ of a star.
a) speed b) age c) size
5. Our sun is about 8 light ___ away.
a) seconds b) minutes c) years
6. Inches and feet are ___ to measure distance.
a) ones b) units c) unities
7. Number 1 with nine zeroes is called a ___.
a) million b) billion c) trillion
8. When we look at the sky at night we see how the stars ___.
a) looked long ago b) will look in future c) look today

16.4. Compare different meaning of the verb *to use*. Fill in the gaps with *used to* or a form of *be used to*.

to use + Noun	**використовувати щось**
Nowadays most cars *use* internal combustion engines.	Сьогодні більшість автомобілів використовують двигуни внутрішнього згоряння.
to be (to get) used to + Noun (V-*ing*)	**звикнути до чогось**
We *are so used to* mobile phones today that we cannot imagine our lives without them.	Ми сьогодні настільки звикли до мобільних телефонів, що не уявляємо свого життя без них.
used to + Infinitive	**(звична дія у минулому)**
Summers *used to be* not so hot before. = Summers *didn't use to* be so hot before.	Раніше влітку не було так жарко.

1. My parents ___ (travel) to other countries when they were young, but now they ___ (go) to places that are nearby. 2. This street ___ (be) very dark until the new lights were installed. 3. He doesn't have any problem getting to work at 8:00 in the morning because he ___ (get up) early. 4. Once grandparents, parents and children ___ (live) together, but now grandparents ___ (live) by themselves. 5. At one time American mothers ___ (hope) their sons would grow up to become President. 6. Before he became ill, he ___ (play) tennis every morning. 7. She's so ___ (go to bed) early that she hardly ever goes out at night. 8. For a long time, people ___ (think) that the world was flat and that people could fall off the edge. 9. They ___ (have) a lot of money, but now they are poor. 10. Today many children ___ (watch) TV for hours instead of

doing their homework. 11. We ___ (go) to the country every summer, but now we can't afford to. 12. I'm now ___ (eat) hamburgers, but at first I didn't like them. 13. In many banks, machines are doing the work that tellers ___ (do). 14. People ___ (catch) fish in this river, but now the river has become polluted.

PRACTICE

16.5. Disagree with the statements. Use the expressions: *Certainly, not / I can't agree with it / It's not true / I'm afraid, this is wrong / I totally disagree / I don't think so* etc. Then give a correct statement.

1. A light year is a way of measuring time. 2. We are used to measuring distances in miles. 3. Astronomers use microscopes to look at stars. 4. People like to use numbers with many digits. 5. Light travels at a speed of 300 km per hour. 6. Using a light year as a distance measurement helps determine the age of the Earth. 7. Our Sun is 8 light years away. 8. All other stars are closer to us than the Sun.

GRAMMAR FOCUS

16.6. Note how unlikely events are mentioned in the text: *If the sun were to suddenly explode right now, we wouldn't know about it for eight minutes.* Use similar pattern to translate the sentences.

1. Якщо б розтанули всі льодовики на Землі, рівень світового океану піднявся б на 70 метрів. 2. Якщо б ви відправились на Марс сьогодні, подорож зайняла б 9 місяців. 3. Якщо б ми розуміли мову тварин, ми б дізнались набагато більше і про людей. 4. Що б ви зробили, якби ви стали ректором університету? 5. Якби наша країна вирішила перейти на альтернативні джерела енергії, скільки б це зайняло часу? 6. Якщо б сила тяжіння раптом зникла, наша планета би зруйнувалась. 7. Якщо б ви обирали місце, де жити, яку б країну ви вибрали?

FOLLOW UP

16.7. Find information on "less scientific" units of measurement, e.g. *a span*, and give a short report.

UNIT 17. EFFICIENT UTILIZATION OF SOLAR ENERGY

PRE-READING

Make a list of alternative sources of energy you know. How widely are they used in your country, city?

ACTIVE VOCABULARY

a source	джерело	to reflect	віддзеркалювати
utilization	використання	liquid	рідина; рідкий
to exist	існувати	to evaporate	випаровуватись
to provide	забезпечувати	a plant	*(тут)* установка
to melt	плавити, танути	to reduce	зменшувати
quantity	кількість	remote	віддалений
an installation	установка	to lack	бракувати, не вистачати

READING

17.1. Read the text and say whether these statements are TRUE or FALSE.

The sun is the source of all main forms of energy. We must learn to gather and store sunlight and convert its energy into other forms of energy. Today man converts solar energy into electricity with an efficiency of about 10 per cent. This is not much, but not long ago this also seemed impossible.

Systematic work on the utilization of solar energy began in the 1920s. Today there exists a project of solar electric station which will generate 2,500,000 kWh of electricity a year. That is not very much, but the power will be quite cheap. Engineers try to design power stations which will use principles of direct conversion of solar energy into electric one.

The solar energy provides the conditions which are necessary for man's life on the earth. But man may also make the sun heat and cool his homes, produce fresh water from sea water, melt metals and generate great quantities of electric power.

How can the sun cool a house? The principle of the solar installation is **both** simple **and** original. The rays concentrated in and reflected by the mirror fall on to a cylindrical boiler filled with a liquid known as Freon which evaporates at a temperature of 15-18 °C. In summer, solar energy sets the refrigeration plant in motion and the vapours of Freon, entering the refrigerator installation through pipes, create an inside temperature 10-15° lower than outside. The more intense the

radiation, the faster the temperature falls. The installation operates non-stop with the help of a “time relay” which keeps the mirror always turned towards the sun.

Solar energy specialists are now working to reduce the size of solar installations and make them more economical, compact and easier to transport to remote regions that lack power sources.

1. Only a small part of solar energy that reaches the earth is used by man. 2. It is possible to produce fresh water from sea water using the sun’s energy. 3. A solar installation can operate non-stop 24 hours a day. 4. The efficiency of the solar cooling installation depends on the intensity of solar radiation. 5. Specialists think that present-day solar installations have a good size and are compact and economical enough.

SPEECH PATTERNS

17.2. Analyse the speech pattern and translate the sentences into English using the pattern.

both ... and	**не тільки ..., а й ...; як ..., так і ...**
He is good at both natural sciences and humanities.	Він здібний як до природничих наук, так і до гуманітарних.

1. Вісь може обертатись разом з колесами, а може бути закріпленою нерухомо. 2. Гелікоптер може рухатись вперед, назад, а також зависати в повітрі. 3. Для виявлення поверхневих дефектів використовуються як радіохвилі, так і ультрафіолетові та інфрачервоні промені. 4. Деякі види тварин живуть як у воді, так і на землі. 5. Аморфні тіла мають властивості як твердих тіл, так і рідин.

VOCABULARY

17.3. Give synonyms to the following words:

to gather; to store; to convert; utilization; to begin; to design; to provide; necessary; to produce; an installation; to enter; to fall; remote.

17.4. Match the words from the text (in the box) with the following definitions:

1) the capacity of a body or system to do work; 2) any phenomenon associated with stationary or moving electrons, ions, or other charged particles; 3) any of a number of chemical elements that are often lustrous ductile solids, have basic oxides, form

positive ions, and are good conductors of heat and electricity; 4) a large device, system, or piece of equipment; 5) a surface, such as polished metal or glass coated with a metal film, that reflects light without diffusion and produces an image of an object placed in front of it; 6) a closed vessel or arrangement of enclosed tubes in which water is heated to supply steam to drive an engine or turbine or provide heat; 7) particles of moisture or other substance suspended in air and visible as clouds, smoke, etc; 8) the emission or transfer of radiant energy as particles, electromagnetic waves, sound, etc; 9) an electrical device in which a small change in current or voltage controls the switching on or off of circuits or other devices; 10) a chamber in which food, drink, etc., are kept cool.

a boiler; vapour; a refrigerator; a mirror; radiation; an installation; a metal; energy; electricity; a relay

PRACTICE

17.5. Analyse the patterns of the sentences from the text (left column) to translate the sentences into English (right column).

Sun is the source of energy.	Вода – джерело життя на Землі.
Today there exists a project ...	Сьогодні існує багато видів транспорту для подорожей.
Man may make the sun heat and cool his homes.	Тепло змушує частинки рухатись швидше.
Freon evaporates at a temperature of 15-18 °C.	Свинець плавиться при температурі 328 градусів Цельсія.
... create an inside temperature 10-15° lower than outside.	Сьогодні температура на 8 градусів вища, ніж учора.
The more intense the radiation, the faster the temperature falls.	Чим вища концентрація кислоти, тим скоріше відбуватиметься реакція.
... “time relay” which keeps the mirror always turned towards the sun.	Після застосування крапель не відкривайте очі приблизно 30 секунд.

GRAMMAR FOCUS

17.6. Find and correct one mistake in each sentence.

1. The solar energy is now converts to electricity with the efficiency of 10 percent. 2. People starting to use solar energy in 1920s. 3. Engineers tries to turn solar energy

into electricity directly. 4. Solar energy may been also used to heat or cool homes. 5. In a new installation, Freon are used which evaporates at a temperature of 15-18 °C. 6. The installation using Freon makes the inside temperature 10-15 degrees lowest than outside. 7. As more sun, as more the temperature falls. 8. The mirrors in the installation are always turn towards the sun. 9. Solar energy specialists try to make the installation more easier to transport to remote regions. 10. If used properly, the sun may become our goodest friend.

FOLLOW UP

17.7. Find the information and make a short report on the utilization of another non-fossil source of energy, e.g. wind, tides, bio-fuels etc. in your region.

UNIT 18. UN: WORLD MUST END "DIRTY" FUEL USE

PRE-READING

In your opinion, what are the problems and possible solutions of transition from fossil ("dirty") fuels to renewable energy sources?

ACTIVE VOCABULARY

to curb	стримувати	a measure	захід, міра
rapidly	швидко	to be faced	стикатись
a shift	перехід	an estimate	оцінка (приблизна)
renewable	відтворювані	to phase out	витісняти
to release	випускати	to boost	підтримувати
a panel	комісія	annual	щорічний
to acknowledge	визнавати	a host of smth.	купа, маса
a conclusion	висновок	an assumption	припущення
onwards	надалі	feasible	здійсненний, можливий

READING

18.1. Read the text and answer the questions.

A long-awaited UN report on how to curb climate change says the world must rapidly move away from carbon-intensive fuels. There must be a "massive shift" to

renewable energy, says the study released in Berlin by the Intergovernmental Panel on Climate Change (IPCC).

The authors acknowledge that a transition from fossil fuels to renewable energy is easier to recommend than to achieve. Many countries are locked into using fuels like coal.

Here in Germany coal provides nearly half the electricity. But because greenhouse gases are building up in the atmosphere so rapidly, the conclusion is that it's better to make the change sooner rather than later. Professor Jim Skea at Imperial College is a leading figure on the panel.

"The message is that we need to start from 2020 onwards. If we wait as long as 2030 to put in place measures, it is going to start to get difficult. Emissions have risen more quickly in the last ten years than they did at any point in the past, and if we carry on in that kind of way till 2030, then we will be faced with these difficult choices. We need to move much more quickly than that."

One surprise is a low estimate for the cost of phasing out fossil fuels and boosting wind and solar power. The panel says that less than one tenth of 1% will be shaved off annual global growth. However, this figure rests on a host of assumptions, and for the moment, renewable energy still needs subsidies, which raises questions about public acceptance.

The panel does believe its options are feasible and it hopes they'll be implemented in the coming years.

1. What subject is the UN report devoted to? 2. What fuels must be a replacement for carbon fuels? 3. What does the abbreviation IPCC stand for? 4. Why is it not so easy to make shift to renewable energy? 5. What part of electricity in Germany is produced using coal? 6. When does the UN Panel on Climate Change suggest starting the transition to renewable energy? 7. What kinds of renewable sources of energy are they going to use? 8. How much will it take globally to phase out fossil fuels? 9. Is renewable energy repaid at the moment?

SPEECH PATTERNS

18.2. Analyse the speech pattern and translate the sentences into English using the pattern.

do + Verb (in affirmative sentences)	дійсно, дуже (для виділення присудка)
Miracles do happen.	Чудеса таки відбуваються.

1. Він каже, що він дійсно бачив НЛО. 2. Ковка та пресування дійсно покращують властивості металу. 3. Хром та нікель дуже підвищують корозійну стійкість сталі. 4. Паровий двигун дійсно став символом та відправною точкою індустріальної революції. 5. Деякі люди впевнені, що снігова людина таки існує.

VOCABULARY

18.3. Fill in the gaps in the expressions in the left column with words and expressions in the right column and translate them into your native language.

1	a long ___ report	a	panel
2	move ___ from carbon fuels	b	coming
3	___ on Climate Change	c	up
4	transition from ___ fuels to renewable energy	d	as ... as
5	greenhouse gases are building ___ in the atmosphere	e	more ... than
6	sooner ___ than later	f	awaited
7	to wait ___ long ___ 2030	g	one
8	to carry ___ in that kind of way	h	with
9	to move much ___ quickly ___ that	i	away
10	to phase ___ fossil fuels	j	on
11	less than ___ tenth of 1%	k	fossil
12	a host ___ assumptions	l	rather
13	to be implemented in the ___ years	m	out
14	will be faced ___ difficult choices	n	of

18.4. Fill in the gaps with the word from the text in the correct form. The definition in the brackets will help you. Example: *What <u>is going on</u> ? (to happen).*

1. Due to high costs, the program was never fully ___. (to execute) 2. An unskilled youth ___ a difficult life. (to encounter) 3. The average temperatures have ___ globally. (to increase) 4. The patient feels ___ today than yesterday. (fine) 5. The first invented Relay was ___ as part of a telegraph system circa 1844. (to utilize) 6. Learning a second language is ___ than one may think. (simple) 7. At the University you are obtaining quality education that will be ___ by employers and other educational institutions. (to recognize) 8. There are more than four million surgical procedures performed ___ worldwide. (every year) 9. Conservation of angular momentum explains why an ice skater spins more ___ as she pulls her arms

in. (quickly) 10. Carbon emissions are at their highest ever levels in history, according to the latest ___ from the International Energy Agency (IEA). (an approximate calculation)

GRAMMAR FOCUS

18.5. Note how future actions are expressed in the text. Use these patterns to translate the sentences.

the world must rapidly move away from carbon-intensive fuels	*must, need to* + V – for necessary future actions
it's better to make the change	*it's better to* + V – for recommended future actions
if we wait as long as 2030	*if* + Present – for conditions
it is going to start to get difficult	*be* + *going to* + V – for inevitable future actions
we will be faced with these difficult choices	will + V – for predicted future actions

1. У майбутньому всі виробництва будуть безвідходними. 2. Краще їсти здорову їжу, а не фаст-фуд. 3. Вам необхідно підзаряджати батарею кожного дня. 4. Ви обов'язково зустрінете його на виставці. 5. Ми завжди маємо думати про наслідки наших дій. 6. Якщо програма зависне, перезавантажте комп'ютер.

18.6. Put the words in the correct order to make a sentence. Note that the first word is not indicated.

1. a, issued, Panel, report, the, Climate, has, UN, on, Change. 2. of, to, energy, must, renewable, shift, we, rapidly, sources. 3. fuels, not, it, give, immediately, easy, fossil, is, to, up. 4. Germany, coal, half, provided, nearly, electricity, the, by, in, is. 5. the, accumulating, gases, atmosphere, greenhouse, in, are. 6. last, in, industrial, years, have, harmful, ten, emissions, risen, much, the. 7. out, may, phase, solar, fuels, wind, and, power, traditional. 8. the, percent, for, less, world's, renewable, one, account, sources, energy, than, of. 9. do, is, catastrophes, that, feasible, preventing, specialists, believe, ecological.

FOLLOW UP

18.7. Find the information on the latest international agreements on climate change and make a short report.

UNIT 19. SELF-CALIBRATING MICRO MACHINES

PRE-READING

The word *to calibrate* means *to correlate the readings of (an instrument) with those of a standard in order to check the instrument's accuracy*. Give some examples of calibrating in your field of study or work.

ACTIVE VOCABULARY

a promise	обіцянка	incongruity	несумісність, невідповідність
a drawback	недолік	thus far	до сих пір
namely	а саме	to determine	визначати
precise	точний	to apply	застосовувати
to inherit	наслідувати	a property	властивість
inaccuracy	неточність	capacitance	ємність
minuscule	дуже маленький	to figure out	зрозуміти
to ensure	забезпечити	to exert	прикладати (силу)
uniform	однаковий	to sniff out	винюхувати
reliably	надійно	a threat	загроза

READING

19.1. Read the text and correct the following statements.

Micro electromechanical systems – or MEMS – hold a lot of promise for the future of high tech, but they also have their drawbacks, namely that they aren't very precise. That's because at such small scales there are no standards by which to measure very small forces or distances. But a team of Purdue researchers has developed a way for MEMS to self-calibrate, potentially opening the door to a variety of super-precise sensors and instruments used in everything from medicine to engineering to defense.

MEMS inherit their inaccuracy from their minuscule size and the way they are fabricated. At such small size – we're talking **sizes down to** billionths of a meter – it's

not possible to ensure that MEMS are uniform. Since no two MEMS can be reliably manufactured to be exactly the same, **there has to be** some means of calibrating them to cancel out those incongruities. But it's very difficult to measure distances, and especially forces, at those small levels as well, and thus far there has been no standard by which to calibrate two MEMS to function or measure exactly the same way.

The new technology, termed electro micro metrology (EMM), allows engineers to determine the force being applied to a MEMS device. EMM defines the mechanical properties of MEMS by measuring electronic properties, which are easier to measure than physical forces at that scale. By measuring a MEMS device's capacitance, the storage of electrical charge, researchers are able to figure out the shape, stiffness, and force being exerted by or on the device with precision.

More precise, self-calibrating MEMS mean better and cheaper atomic force microscopes, extremely sensitive sensors for sniffing out chemical threats, high-powered lab tools enabling more effective biotech and nanotech research, and perhaps even a super-sensitive "nose-on-a-chip" that can track or identify criminal suspects.

1. MEMS stands for measuring electronic modular system. 2. The main drawback of MEMS is that they are very expensive. 3. The researchers dealing with calibrating MEMS work at Stanford University. 4. MEMS can be used in agricultural machines. 5. All MEMS are fabricated uniform and very accurate. 6. It is very easy to measure distance and forces of small-scale objects. 7. There is a standard for calibrating MEMS to function and measure the same way. 8. The researchers have developed a technology called MMM. 9. The technology allows to measure radiation from the MEMS device. 10. The new technology determines mechanical properties by measuring chemical properties of the device. 11. The researchers measure the device's length, width, depth and height with a ruler. 12. More precise MEMS may be used in sensitive sensors to detect the light from the stars.

SPEECH PATTERNS

19.2. Analyse the speech patterns and translate the sentences into English using the patterns.

size (height etc.) down to (up to)	**розміром (висотою) аж до**
We're talking **sizes down to** billionths of a meter.	Йдеться про розміри аж до мільярдних часток метра.

A. 1. За допомогою струменевих насосів можна отримати вакуум з тиском до 10^{-6} Па. 2. Хвилеводи проводять радіохвилі з частотою до 100 ГГц. 3. Найважчий ручний молот був масою 20-30 кг. 4. Міжнародній команді вчених вдалось зменшити розмір транзистора до 1 атома. 5. Цього літа температура сягала аж до 35 ^{0}С. 6. У грудні ціни на нафту знизились до 54 доларів за барель. 7. Вдень температура на поверхні Місяця сягає 127 градусів Цельсія, а вночі може впасти аж до 173 градусів нижче нуля.

there + *to be*	**є; існує**
There is only one solution of this equation.	Існує тільки одне рішення цього рівняння.
There has always been a need for communication between people.	Потреба у комунікації між людьми існувала завжди.
Some people think that *there should be* warning labels on junk food similar to tobacco.	Деякі люди вважають, що на продуктах швидкого харчування має бути таке ж попереджувальне маркування, як на тютюнових виробах.

B. 1. Сьогодні існує багато велосипедів самих різних конструкцій. 2. В історії було багато спроб створити вічний двигун. 3. До кінця 18 століття в Європі існувало багато неузгоджених між собою одиниць фізичних величин. 4. Існує два основних типи двигунів внутрішнього згоряння – бензинові та дизельні. 5. Вчені стверджують, що повинні існувати частинки менші за бозон Хіггса.

VOCABULARY

19.3. Use the given words from the text instead of the underlined words below. Change the word form if necessary.

shape variety research minuscule to term drawback researcher instrument property to fabricate to exert

1. A set of computer instructions designed to solve a specific problem is referred to as a program. 2. The paper presents a comprehensive comparative study on seven different engine models. 3. The laboratory is equipped with state-of-the-art devices, tools, and measurement equipment. 4. Nowadays, crystals are produced artificially to satisfy the needs of science, technology and jewellery. 5. Scientists have invented a new tiny camera that can provide high-definition 3-D images of blood vessels in your

organism. 6. Any object or material that touches another object applies a force on that object. 7. The Nature Reserve, with about 2500 acres, has a great diversity of plants and animals. 8. The name for a geometric form of a diamond is a rhombus. 9. While amorphous materials differ in significant ways, they exhibit common features. 10. Residential solar power has some aesthetic, economic and technical flaws, but many of them can be overcome by planning and responsible maintenance.

PRACTICE

19.4. Write down all the adjectives from the text with the corresponding noun. Think of other nouns and possible number of objects that can be characterised by these adjectives. Example: electromechanical + system (brake, controller, ...) (dozens); small + scale (force, ...) (thousands).

GRAMMAR FOCUS

19.5. Put the verb *to be* in the proper form.

Micro electromechanical systems (MEMS) ___ not very precise. This ___ their main drawback. MEMS' miniature size ___ the main reason for their inaccuracy. When they ___ manufactured, there ___ no way to make them uniform. A new technology – self-calibrating MEMS – ___ proposed some time ago. It ___ developed by Purdue researchers. Electrical rather than mechanical properties ___ measured because it ___ difficult to determine shape, stiffness and other mechanical characteristics when objects ___ so tiny. The application areas for this invention ___ medicine, engineering, defense etc. I ___ sure this invention ___ introduced in various spheres of technology in the nearest future.

FOLLOW UP

19.6. Describe a way to calibrate a simple measuring device, e.g. a thermometer.

UNIT 20. THE HISTORY OF IG NOBEL PRIZE

PRE-READING

The Nobel Prize is an annual international award given in recognition of academic, cultural, and / or scientific advances. Mention several facts you know about the Nobel Prize. How do you think Ig Nobel prize is different?

ACTIVE VOCABULARY

to honour	шанувати	requirement	вимога
subsequent	наступний	tongue-in-cheek	іронічний
genuine	справжній	contaminated	забруднений
veiled	прихований	probability	ймовірність
an article	стаття	to predict	передрікати

READING

20.1. Read the text and answer the questions.

The Ig Nobel Prizes are a parody of the Nobel Prizes and are given each year in early October for ten unusual or trivial achievements in scientific research. The stated aim of the prizes is to "honor achievements that first make people laugh, and then make them think." The awards are presented by a group that includes Nobel Laureates at a ceremony at Harvard University's Sanders Theater, and they are followed by a set of public lectures by the winners at MIT.

The first Ig Nobels were created in 1991 by Marc Abrahams, editor and co-founder of the Annals of Improbable Research, a magazine devoted to scientific humor, and the master of ceremonies at all subsequent awards functions. The prizes are awarded in many fields, including the Nobel Prize categories of physics, chemistry, physiology / medicine, literature, and peace, but also other areas such as public health, engineering, biology, and interdisciplinary research. The Ig Nobel Prizes recognize genuine achievements, discoveries made as a result of real scientific research.

The awards are sometimes veiled criticism (or gentle satire), but most often, however, they draw attention to scientific articles that have some humorous or unexpected aspect. Examples **range from** the statement that black holes fulfill all the technical requirements to be the location of Hell, **to** research on the "five-second rule", a tongue-in-cheek belief that food dropped on the floor will not become contaminated if it is picked up within five seconds.

In 2013 the Ig Nobel prize in probability went to Bert Tolkamp [UK, the Netherlands], Marie Haskell [UK], Fritha Langford [UK, Canada], David Roberts [UK], and Colin Morgan [UK], for making two related discoveries. First, that **the longer** a cow has been lying down, **the more likely** that cow will soon stand up. And second, that once a cow stands up, you cannot easily predict how soon that cow will lie down again.

The 2014's prize in physics was given to Kiyoshi Mabuchi, Kensei Tanaka, Daichi Uchijima and Rina Sakai [JAPAN], for measuring the amount of friction between a shoe and a banana skin, and between a banana skin and the floor, when a person steps on a banana skin that's on the floor.

In 2015, chemists from Australia and the USA received a prize for inventing a chemical recipe to partially un-boil an egg.

The 2016 Ig-Nobel Prize went to German chemists who found that if a person had an itch on the left forearm, they could relieve the itch by looking into a mirror and scratching the right forearm.

Marc-Antoine Fardin, a physicist from France, won the 2017 prize for stating that cats can be considered liquids because like liquids cats conform to the shape of the container they are sitting in but retain constant volume.

LOL.

1. When does the annual Ig Nobel prize ceremony take place? 2. Who is the founder of the Ig Nobel prizes? 3. How old is this tradition? 4. What is the aim of these prizes? 5. Where does the awarding take place? 6. Who awards the laureates? 7. In what categories are the prizes given? 8. Give an example of a research awarded by the Ig Nobel prize.

20.2. Fill in the gaps.

1. Ig Nobel prizes tradition was founded ___.
a) last year b) in early 90s c) at the beginning of the 20th century d) in 2000
2. The Ig Nobel prizes are given to ___.
a) students b) scientists, politicians, engineers etc. c) actors d) scientists
3. The achievements of the laureates make people ___.
a) cry b) yawn c) laugh d) sleep
4. The ceremony takes place at ___.
a) Harvard b) Oxford c) Cambridge d) MIT
5. The awards are presented by ___.
a) Ig Nobel laureates b) Hollywood actors c) the US President d) Nobel laureates
6. Marc Abrahams is ___.
a) the first Ig Nobel laureate b) the 2013 Ig Nobel laureate c) the editor of a magazine d) a dean at Harvard
7. Ig Nobel prize is not awarded in ___.

a) chemistry b) peace c) literature d) mathematics

8. A five-second-rule deals with ___.

a) spacecraft launch b) food dropped on the floor c) lifetime of Higgs boson d) half-life period of beryllium-8

9. Every year ___ Ig Nobel awards are given.

a) 10 b) 12 c) 20 d) 5

10. The Ig Nobel awards ceremony takes place in ___.

a) winter b) spring c) summer d) autumn

SPEECH PATTERNS

20.3. Analyse the speech patterns and translate the sentences into English using the patterns.

to range from ... to	від ... до; знаходитись в діапазоні
Laser radar applications range from shipbuilding to Martian surface profiling.	Застосування лазерних радарів широке: від суднобудування до аналізу профілю марсіанської поверхні.

A. 1. Загальноприйняте, що нормальна температура тіла знаходиться в діапазоні між 36,1 ^{0}C та 37,2 ^{0}C. 2. Частоти ультразвуку знаходяться в межах від 20 кГц до 10^9 Гц. 3. Діапазон його спортивних інтересів – від роликових ковзанів та велосипеда до парашутного спорту. 4. Потужність генераторів може бути від декількох ват до сотень мегават. 5. Лампи розжарювання бувають напругою від часток до сотень вольтів.

***the* + Comparative, *the* + Comparative**	чим ..., тим ...
The more, the merrier.	Чим більше людей, тим веселіше.
The higher the number on Mohs hardness scale, the harder the mineral.	Чим вище число за шкалою твердості Мооса, тим твердіший мінерал.
The faster an object moves through a fluid, the greater the force of friction.	Чим швидше об’єкт рухається крізь рідину, тим більша сила тертя.

B. 1. Чим більша площа пластин конденсатора і менша відстань між ними, тим більша ємність конденсатора. 2. Чим довший важіль, тим більша його підйомна сила. 3. Чим вище тиск, тим вища температура кипіння. 4. Чим вища температура рідини, тим нижча її в’язкість. 5. Чим важчий космічний корабель,

тим більше палива він споживає. 6. Чим швидше обертається жорсткий диск, тим більша його температура і шум.

VOCABULARY

20.4. Give the English equivalents of the following expressions:

наукове дослідження; привертати увагу; визнавати реальні досягнення; два взаємопов'язані відкриття; премія з теорії вірогідності; задовольнити технічні вимоги; примушувати людей сміятись; міждисциплінарні дослідження; наступні церемонії.

GRAMMAR FOCUS

20.5. Find in the text adjectives with negative prefixes. What other negative prefixes do you know? Give 3 examples with each prefix.

20.6. Note some sentences from the text expressing passive actions. *The Ig Nobel Prizes are given each year. The first Ig Nobels were created in 1991 by Marc Abrahams.* **Use Passive voice to translate the following sentences.**

1. Нобелівська премія була заснована згідно з заповітом шведського підприємця, винахідника та філантропа Альфреда Бернарда Нобеля. 2. Згідно з волею Нобеля, річний прибуток від його спадщини має ділитися на 5 рівних частин між особами, які попереднього року найбільше прислужилися людству в різних галузях діяльності. 3. Сума премії змінюється залежно від доходів фундації Нобеля. 4. Нобелівська премія призначається у галузях фізики, хімії, фізіології або медицини, економіки, літератури та особливі досягнення у справі миру. 5. Церемонії нагородження Нобелівських лауреатів організовуються щорічно 10 грудня. 6. Золоту медаль та диплом лауреата вручає король Швеції. 7. Нобелівський концерт вважається однією з головних музичних подій року.

FOLLOW UP

20.7. Learn about the latest Ig Nobel prize winners and make a short report.

UNIT 21. SEED RACER

PRE-READING

In pairs discuss what parts of a car you know. How are they different from one model to another? Share your ideas with the class.

ACTIVE VOCABULARY

decade	десятиріччя	lifespan	термін служби
supercharged engine	двигун з наддувом	to accommodate	вміщати
antilock brakes	протизаклинювальні гальма	handling	управління
to unveil	відкривати	to assemble	збирати
a vehicle	транспортний засіб	a seed	зернятко, зародок
to sow (sowed, sown)	сіяти	to germinate	проростати
nursery	інкубатор	far-out	дивний, нетрадиційний
to emit	випускати	as such	як такий

READING

21.1. Read the text and say whether the following sentences are TRUE or FALSE.

Mercedes-Benz, which is known for its reliable cars, has been an innovator for decades. You can thank the German auto manufacturer for diesel and supercharged engines on passenger cars, antilock brakes, electronic stability systems and more. But nothing could be more innovative than the BIOME concept car, unveiled at the Los Angeles Auto Show in November 2010. Here's how the journalists who attended the exhibition described the vehicle in their press release: "The Mercedes-Benz BIOME grows in a completely organic environment from seeds sown in a nursery. The exhausts it produces are pure oxygen, and at the end of its lifespan it can be simply composted or used as building material."

Engineers from the Mercedes-Benz Advanced Design Studios in Carlsbad, Calif., created the car as part of the Los Angeles Design Challenge, whose aim was to invent a safe and comfortable compact car of the future that could accommodate four

passengers, demonstrate good handling and **weigh only 1,000 pounds** (454 kilograms). The BIOME represents the Mercedes-Benz vision. It is made from an ultralight material which is called BioFibre so that the finished vehicle, though wider than a typical car, only weighs 876 pounds (397 kilograms). If you think that sounds too good to be true, then get this: The BIOME isn't assembled. It grows from two seeds – one that forms the interior and one that forms the exterior. The wheels germinate from four additional seeds placed in the nursery.

Of course, you won't find the BIOME at your local Mercedes-Benz dealer. That's because the far-out design is a vision of the future – a concept car that's decades ahead of its time. As such, it couldn't exist today. But it might be as common as a Corolla after 20 or 30 years of innovative thinking and inspired engineering.

1. A new BIOME car was first presented in France. 2. The car weighs less than half a ton. 3. The car is made of microfibre. 4. The new BIOME car is on sale in Germany now. 5. The new vehicle is produced using the traditional technology. 6. The car can accommodate 4 passengers. 7. The exhaust gases of the car are extremely poisonous. 8. If you don't need the car any more you can use it as a construction material.

SPEECH PATTERNS

21.2. Analyse the speech pattern and translate the sentences into English using both patterns.

It weighs 1,000 pounds = Its weight is 1,000 pounds	Він важить 1000 фунтів.

1. Земля важить приблизно 6×10^{24} кілограм. 2. Протон важить майже стільки, скільки нейтрон. 3. Гігантські крани можуть важити до 350 тон. 4. Діамант в один карат важить 0,2 грама. 5. Новонароджене кенгуреня важить всього 1 чи 2 грами.

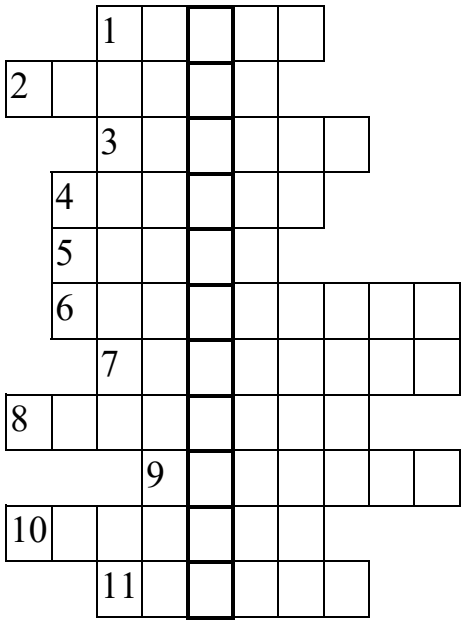
VOCABULARY

21.3. Complete the vocabulary categories with nouns from the text. Add 5 more nouns to each category.

People	Things	Actions	Places
manufacturer	auto	release	auto show

21.4. Fill in the gaps with the words from the text to complete the crossword. The words are given in the box. Read a secret word in the selected column.

design innovator wheel vehicle future handling organic invent fibre assemble engine



1. The ___ is probably the most important mechanical invention of all time. 2. The internal combustion ___ was (3) ___-ed by Jean Joseph Etienne Lenoir in 1860. 4. Computer-aided ___ is an important industrial art extensively used in many applications including automotive, shipbuilding, and aerospace industries and many other fields. 5. A ___ optic cable consists of a bundle of glass threads, each of which is capable of transmitting messages modulated onto light waves. 6. Someone who introduces changes and new ideas is called an ___. 7. Ease of ___ and braking are the major components of a vehicle's safety. 8. Car manufacturers ___ thousands of components together to manufacture a finished (9) ___. 10. Biomass is fuel that is developed from ___ materials, a renewable and sustainable source of energy used to create electricity or other forms of power. 11. When men speak of the ___, the gods laugh.

PRACTICE

21.5. Complete the micro-dialogues.

1. ___. – It's too good to be true. 2. ___. – You can thank Mr. ___ for this. 3. ___. – Nothing can be more absurd than this. 4. If you don't believe me, now get this: ___. – Incredible! 5. ___? – It can be made from wood, plastic, glass and other materials. 6. ___? – It can accommodate 4 passengers. 7. ___? – I have been at the University for ___ years. 8. What is the aim of this exercise? – ___.

GRAMMAR FOCUS

21.6. Note how relative clauses (underlined in the text) are used. Some of them are separated with comas, some of them – not. Some of them start with a conjunction (*that, whose, who, which*), some of them have no conjunctions.

Analyse the context to understand these differences and translate the sentences into English.

1. Автомобілі, які працюють на акумуляторних батареях, не виробляють шкідливих викидів. 2. В Чилі, яка в 1934 році була світовим постачальником йоду, був винайдений йодний акумулятор. 3. Безпілотні автомобілі, які ми бачили тільки у кіно, вже скоро з'являться на наших вулицях. 4. Використання дизельних двигунів, ефективність яких в 1,5-2 рази вища за бензинові, дозволяє значно економити пальне. 5. В Німеччині розробляються дизельні двигуни, які могли б працювати безпосередньо на неперероблені рослинній олії. 6. Гібридний автомобіль Toyota Prius, який вперше надійшов у продаж в Японії в 1997 році, зараз продається по всьому світу. 7. Водії, які їздять на електромобілях, користуються податковими пільгами в багатьох країнах. 8. Автомобіль на сонячних батареях, що був розроблений співробітниками та студентами університету Південної Австралії, важить всього десь 300 кг.

FOLLOW UP

21.7. Find additional information on ecologically friendly vehicles and make a short report.

UNIT 22. MAGNETIC BACTERIA COULD CREATE COMPUTERS OF THE FUTURE

PRE-READING

Look through the title and active vocabulary. Try to predict what function can magnetic bacteria perform in a computer.

ACTIVE VOCABULARY

conventional	традиційний	to reside	знаходитись
to come at a cost	ставати дорожчим	to coax	добиватись
to enlist (help)	заручатись (підтримкою)	to churn out	виробляти; штампувати
to harness	підкорювати	a wire	дріт
environ	середовище	to exchange	обмінюватись
protein	білок	to allow for	забезпечувати

to imbue	насичувати	biocompatible	біологічно сумісний
to feed	годувати	to blur	стирати, згладжувати
essentially	насправді	surgery	хірургія
whereas	хоча	to throw open (the door)	розчиняти навстіж; надавати можливість

READING

22.1. Read the text and say whether this information is TRUE, FALSE or NOT GIVEN.

As computer components grow smaller and smaller, it becomes more and more difficult to manufacture them by conventional means, meaning the nano-hard-drives of the future **are going to** come at a cost. So researchers from the University of Leeds in the UK and Tokyo University of Agriculture and Technology are enlisting the help of magnetic bacteria, which they say can be harnessed to build tiny computing components similar to those found in conventional PCs, or even to construct the biological computers of the future.

The bacterium *Magnetospirillum magneticum* is a naturally occurring microorganism that lives in underwater environs, using its natural magnetism to swim up and down the Earth's magnetic field lines in search of oxygen. But when they eat iron, special proteins generate tiny crystals of the mineral magnetite within the bacteria, imbuing them with a tiny piece of one of the most magnetic natural materials on the planet.

By feeding the bacteria iron and manipulating the way they colonize, the researchers think they can essentially grow tiny magnets that could serve as components in the minuscule hard drives of the future. Whereas it's really complicated to make very small magnets and shape them so that they can serve as memory devices, these proteins and the bacteria in which they reside can be coaxed into doing all the hard work, creating the magnetic material and churning out regularly-shaped blocks of it.

Moreover, the team has been working to produce tiny electrical wires that allow the exchange of information through cell membranes, allowing for nanoscale communication inside of a computer made up of biological cells. Because these "wires" – they're really more like nano-scale tubes with an electrical resistance that pass through the cell wall – are covered in cell membrane, they are highly biocompatible. That of course throws open the door to all kinds of wild ideas blurring

the line between the electro-mechanical and the biological, like biocompatible computers that could aid in human surgery – or even live permanently inside the human body.

1. Computers and their components are becoming still more expensive. 2. The researchers are trying to use magnetic bacteria to build tiny computer components. 3. In future they want to create chemical computers. 4. Researchers from the University of Leeds in the UK and Tokyo University of Agriculture and Technology have been working on creation of biocomputers for 10 years. 5. The bacterium *Magnetospirillum magneticum* lives on the surface of plants. 6. The bacteria eat iron. 6. Magnetic bacteria generate magnetite under the influence of the Earth's magnetic field. 7. Magnetite is an artificially produced material. 8. The researchers want to use the magnetic bacteria to manufacture minuscule bio hard drives. 9. Biological memory devices will soon be available. 10. Biocompatible computers can be used in surgery and even imbedded into human body.

SPEECH PATTERNS

22.2. Analyse the speech pattern and translate the sentences into English using the pattern.

to be going to do smth.	1) збиратись щось зробити; 2) щось відбудеться з великою вірогідністю.
Scientists are going to use magnetic bacteria as components of hard drives.	Вчені збираються використовувати магнітні бактерії як компоненти жорстких дисків.
It is going to be not an easy thing to do.	Це буде нелегко зробити.

1. Він старанно вчиться, і він обов'язково здасть екзамени добре. 2. Космічний зонд Вояжер-2, перший космічний корабель, який покинув сонячну систему, буде продовжувати свою місію принаймні до 2025 року. 3. Вчені обов'язково знайдуть шляхи більш ефективного використання сонячної та вітрової енергії. 4. В багатьох країнах кількість літніх людей скоро перевищить кількість молодих. 5. Деякі люди вважають, що радіо зникне через розвиток нових комунікаційних технологій та Інтернету.

VOCABULARY

22.3. Find the equivalents and complete the words.

1	manuf___	a	хірургія
2	re___ance	b	підкорювати
3	sur___ry	c	крихітний
4	___ange	d	дослідник
5	ha___ss	e	сільське господарство
6	rese___	f	виробляти
7	___scule	g	традиційний
8	per___tly	h	обмінюватись
9	c___en___al	i	постійно
10	a___ture	j	опір

22.4. Give synonyms to the words from the text. The figure in brackets indicates the number of synonyms you can get from the text. Otherwise you have to find synonyms yourself.

Small (2), to create (5), difficult (2), to aid (1), to live (1), conventional, a researcher, a component, to imbue, permanently.

PRACTICE

22.5. Give your own informal definitions to the following objects, e.g. *a researcher is a person who studies some object to obtain new knowledge about it*. **For more ways to give definitions see Appendix 1.**

a computer; a hard drive; a bacterium; a magnet; a university; magnetic field; oxygen; a crystal; a wire; a cell.

GRAMMAR FOCUS

22.6. Put questions to the underlined parts of the sentences.

1. Researchers from the University of Leeds want to use magnetic bacteria to create tiny computer components. 2. They dream of biological computers of the future. 3. The bacterium *Magnetospirillum magneticum* lives in underwater environments. 4. The magnetic bacterium swims up and down the Earth's magnetic field lines. 5. Magnetite is one of the most magnetic natural materials on the planet. 6. The researchers feed the bacteria with iron. 7. The team of the researchers makes tiny

memory devices out of biological magnetic material. 8. Tiny biological electrical wires allow for nanoscale communication inside of a bio-computer.

22.7. Find linking and functional words underlined in the text. Substitute them with synonymous words or expressions. For reference consult Appendix 1.

22.8. Note how Infinitives are used in the text to express purpose: *bacteria can be harnessed to build tiny computing components; ... using its natural magnetism to swim*. Use Infinitive to translate the sentences below.

1. Вважається, що птахи використовують магнітне поле землі, щоб правильно орієнтуватись. 2. Рослини використовують сонячне світло та силу тяжіння, щоб визначити, в якому напрямку рости. 3. Потрібно ще багато досліджень, щоб зрозуміти, на що здатні різні мікроорганізми. 4. Вчені навчились маніпулювати бактеріями, щоб виростити, наприклад, такий білок як інсулін. 5. Вчені вивчають шляхи застосування пробіотиків, чи «дружніх» бактерій, щоб протистояти патогенним бактеріям.

FOLLOW UP

22.9. Find additional information on the advances in creating biocompatible electronic devices and make a short report.

UNIT 23. LEONARDO DA VINCI'S 1478 SELF-PROPELLED CAR

PRE-READING

Talk to your group-mates and make a list of facts all of you know about Leonardo da Vinci.

ACTIVE VOCABULARY

to come about	траплятися, виникати	due to	завдяки; через
combustion	горіння, згоряння	a spring	пружина
a vehicle	транспортний засіб	a suspension	підвіска
to crawl	повзти	eventually	зрештою
self-propelled	самохідний	to reveal	виявити
unlike	на відміну від	a tambour	барабан

actually	насправді	a casing	корпус, футляр
to instill	викликати, вселяти	to call for	потребувати
awe [o:]	трепет, жах	a cog	зубець, палець
an attendee	відвідувач	a steering	кермо
to speculate	здогадуватись	a gear	механізм
to oversee	наглядати, керувати	a contraption	хитромудрий пристрій
an attempt	спроба	allegedly	нібито

READING

23.1. Read the text and say whether these statements are TRUE or FALSE.

Although most historians agree the birth of the modern car came about in the late 19th century when two Germans, Gottlieb Daimler and Karl Benz, designed real, working internal combustion engines, experiments with moving vehicles weren't uncommon beforehand. **As far back as** 1770, a Frenchman named Nicolas Cugnot developed a steam-powered machine, the Fardier, which could crawl through the streets of Paris at about two miles per hour. It was more than 500 years ago, however – sometime around the year 1478 to be more or less specific – when Leonardo drew out his plans for the world's first self-propelled vehicle.

Unlike Henry Ford's Model T in the early 1900s, Leonardo's car wasn't designed for mass-production. It wasn't truly a passenger car, since it didn't even have a seat. The vehicle was actually designed as a special attraction for Renaissance festivals, meant to instill wonder and awe in attendees. Like many of Leonardo's sketches, however, the car remained on paper throughout his lifetime – we can only speculate that the machine was either considered too dangerous to operate or the inventor didn't have adequate materials to build it.

In 2004, Paolo Galluzzi, director of the Institute and Museum of the History of Science in Florence, Italy, oversaw a project to finally build a working model of Leonardo's invention. Although there were several attempts to build the car during the 20th century, each one had failed due to unclear instructions in Leonardo's sketches. Experts originally believed two leaf springs, the simplest form of the spring typically used for automotive suspensions, somehow powered the vehicle. Closer inspection eventually revealed the power came from bigger, coiled springs located in tambours, cylindrical drum-like casings, inside the car's frame.

Galluzzi and a team of engineers spent four months designing a digital model to make sure they knew the machine would work. Leonardo's designs called for a car 5

feet 6 inches long (1.68 meters) and 4 feet 11 inches wide (1.49 meters), which they built. However, the designers in Florence worried about the machine being too dangerous – once a brake is released, it can travel for about 130 feet (40 meters) – so they built an additional one-third scale model for testing and demonstration.

The machine works like a robot or a wind-up toy simply by rotating the wheels opposite of their intended direction, which winds up the springs inside and gives it power. The frame and many of the car's clockwork-like mechanisms, such as cogs, were made from five different types of wood.

The car also has programmable steering, which is achieved by arranging wooden blocks between gears at pre-set locations, and, oddly enough, it can only turn right. Still, Leonardo must have once again been looking forward to Florence's one-way streets. Although the contraption was allegedly designed for entertainment, Galluzzi's model proved not only that Leonardo's car worked, but the Renaissance man was centuries ahead with yet another influential invention.

1. Karl Benz was the first to design a car. 2. Nicolas Cugnot's automobile was powered by steam. 3. Leonardo da Vinci drew a sketch of a self-propelled vehicle as far back as 1000 years ago. 4. Italian engineers first made a computer model of the machine. 5. Galluzzi and his team additionally constructed a one-fifth scale model for testing. 6. Leonardo's car can turn either ways. 7. The power to the car is given by a spring. 8. Leonardo's car was designed for carrying people to long distances.

23.2. Choose one of the options.

1. Fardier is ___.
a) a nick-name of Gottlieb Daimler b) the name of the inventor of the first automobile c) the name of a car d) a French meal
2. Leonardo da Vinci is also referred to as a ___ man.
a) modern b) Renaissance c) super d) medieval
3. Leonardo's car was designed for ___.
a) entertainment b) mass production c) testing d) a museum
4. The car works like a ___.
a) helicopter b) race car c) model T d) wind-up toy
5. The car is propelled by ___.
a) an internal combustion engine b) springs c) pushing d) rotating pedals

6. a) Leonardo built his car and drove it during a festival.
b) Leonardo never built his car.
c) Leonardo built his car but it was stolen.
d) The car was built by Leonardo's apprentices.
7. Paolo Galluzzi was ___.
a) the director of the Museum of the History of Science b) Leonardo's grand-grand-grand son c) a worker at Karl Benz factory d) a photographer
8. Galuzzi's team made ___ of Leonardo's car.
a) two models b) a one-third scale model c) only a computer simulation d) a laughing-stock
9. According to the design most mechanisms in the car should be made from ___.
a) bone b) stone c) steel d) wood
10. a) Leonardo's car was not supplied with brakes. b) Leonardo's car can only turn right.
c) To move the car one has to turn the steering wheel. d) The length and the width of the car were the same.

SPEECH PATTERNS

23.3. Analyse the patterns and translate the sentences into English using the patterns.

as far back as (= as long ago as) 1770	ще у 1770
as far as I know (see, understand)	наскільки я знаю (бачу, розумію)
as soon as (he comes)	як тільки (він прийде)
as long as (he is absent)	оскільки (його немає)
as well as	а також
as early (many books) **as possible**	якомога раніше (більше книг)

1. Вакуумний насос був винайдений ще у 1650 році німецьким фізиком та інженером Отто фон Геріке. 2. Освіченій людині бажано знати якомога більше мов. 3. Наскільки я знаю, жоден матеріальний об'єкт не може рухатись зі швидкістю більшою за швидкість світла. 4. Оскільки пластик не проводить електрику, то він часто використовується як ізолятор. 5. Будьте якомога уважніші при роботі з отруйними речовинами. 6. Ці сплави розробляються для сьогоднішніх виробництв, а також для технологій майбутнього.

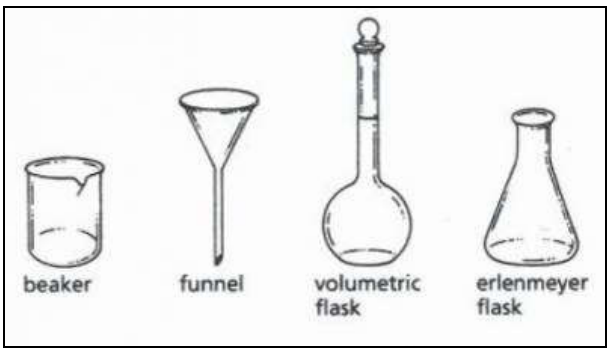
VOCABULARY

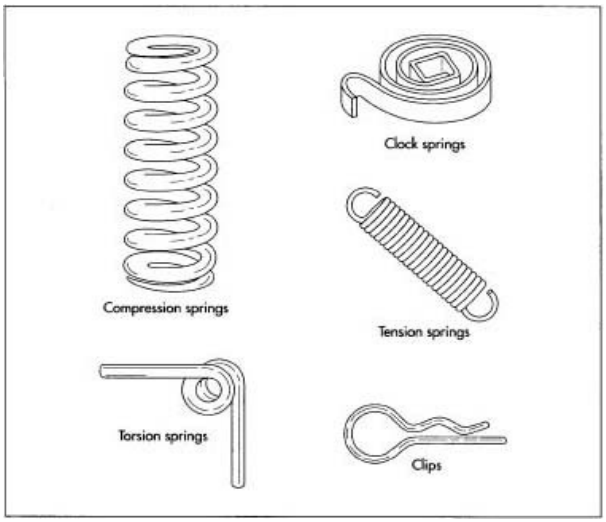
23.4. There are some words in the text whose meaning differs from the similar sounding words in Ukrainian. Use your dictionary to find out the exact meaning of these words. Compose sentences of your own using these words:

specific; actually; speculate; originally; suspension; inspection; tambour; direction.

PRACTICE

23.5. Note the patterns from the text for describing shapes and sizes: *5 feet 6 inches long; 4 feet 11 inches wide; cylindrical drum-like casings*. **For more information see also Appendix 1. Describe the shapes and sizes and possible use of the objects in the pictures.**





GRAMMAR FOCUS

23.6. Note some phrasal verbs in the text, e.g. ***come about, call for*** **etc. Match the following phrasal verbs with their meanings. Compose sentences of your own using these phrasal verbs.**

1	to come about	a	to take care
2	to come down	b	to demand
3	to come down to smth.	c	to seek
4	to come in handy	d	to wait
5	to call for	e	to telephone
6	to call off	f	to turn out useful
7	to call up	g	to decrease
8	to look after	h	to be reduced to sth.
9	to look for	i	to cancel
10	to look forward	j	to happen

23.7. Note the use of Possessive Case in the text, e.g. *world's, Leonardo's, car's* etc. Use the Possessive Case of the nouns to translate the sentences.

1. Фільми Джорджа Лукаса «Зоряні війни» стали класикою наукової фантастики в кіно. 2. Фанати серіалу створили і святкують день Зоряних війн 4 травня. 3. Перший в світі комп'ютер називався ENIAC. 4. Світло Сонця досягає Землі за 8 хвилин. 5. Штат співробітників компанії Google перевищує 50000. 6. Перша ракета компанії SpaceX була запущена на орбіту в 2008 році.

FOLLOW UP

23.8. Find additional information on one of Leonardo's other inventions and make a short report.

UNIT 24. BRITISH ENGINEER DESIGNS OWN HEART VALVE IMPLANT

PRE-READING

Make a list of devices currently used to substitute or support human organs. In small groups or in pairs brainstorm other possible ideas of implants or prosthetic devices.

ACTIVE VOCABULARY

tissue	тканина	computer-aided	автоматизований
rupturing	розрив	a clot	згусток
to pair	поєднувати	to eliminate	усувати, ліквідувати
a valve	клапан	to yield	давати
thinner	розріджувач	to figure out	здогадуватись
to require	потребувати	to suture	накладати шов
to slice-and-dice	кромсати	a recipient	одержувач
to bypass	оминати	a plunge	занурення
to replace	замінювати	a process engineer	інженер-технолог
a graft	трансплантат	amongst = among	серед

READING

24.1. Read the text and anwer the questions.

In 2000, Tal Golesworthy, a British engineer, was told that he suffered from Marfan syndrome, a disorder of the connective tissue that often causes rupturing of

the aorta. The only solution then available was the pairing of a mechanical valve and a highly risky blood thinner. To an engineer like Golesworthy, that just wasn't good enough. **So** he constructed his own implant that does the job better than the existing solution – and became the first patient to try it.

The existing fix, called the Bentall surgery, requires a five-hour invasive slice-and-dice and a heart-lung bypass, after which the damaged part of the aorta is cut out and replaced with a graft and mechanical valve. **But** Golesworthy saw an opportunity instead of despair. Nobody had thought to use more modern technologies, namely combining MRI tests with computer-aided design tools and new rapid prototyping techniques. Golesworthy saw a possibility to create an implant that would support itself and reduce the chance of blood clots, thus eliminating the need to make the blood thinner.

In two years of work, Golesworthy discovered that the hardest part of creating this new implant wasn't the actual design or construction – it was securing reliable measurements. The movement of the heart and other organs made it so that different perspectives yielded totally different measurements. **Luckily**, the team figured out that a scan at one specific point in the cardiac cycle gave them the dimensions they needed.

The final product is constructed of polyethylene terephthalate, a standard medical plastic, and weighs less than 5g. It can be sutured directly into place by a surgeon at relatively low cost. The results speak for themselves: Golesworthy was the first recipient of his own creation, and since then, 23 others have taken the plunge, with more on the waiting list. Golesworthy sees this as not just a victory for Marfan sufferers, but a message to the medical community: "They are all biologists and medics, and they need process engineers," he said. Golesworthy wants a greater collaboration amongst the medical community and engineers, who could see solutions the doctors and biologists can't. **Hopefully** the medical community is listening – he's his own proof, **after all**.

1. What disease did Tal Golesworthy suffer from? 2. How long does the traditional heart surgery last? 3. What modern technologies did Tal Golesworthy propose to use instead of traditional surgery? 4. What material is used for a new implant? 5. How many patients have been already operated on using the new technology? 6. Why do we need a greater collaboration between medics and engineers?

VOCABULARY

24.2. Memorise the linking words and phrases and use them to translate the sentences into English. Classify them into the categories: *Contrasting, Personal attitude, Consequence, Adding information*.

So	Отже; тому
But	Однак
Luckily (Fortunately)	На щастя
Hopefully	Будемо сподіватись, що
Unfortunately	Нажаль
Hence	Отже; в результаті
Therefore	Тому
Nevertheless	Все-таки, як би то не було
Besides	Крім того
In fact	Насправді
By the way	Доречи
On the other hand	З іншого боку

1. Нажаль, багато людей використовують досягнення технологій на безглузді речі. З іншого боку, часто неможливо передбачити всі потенційні застосування того чи іншого винаходу. 2. На щастя, існують альтернативні джерела енергії, що допоможуть зберегти ресурси Землі та довкілля. 3. Доречи, багато пристроїв, які були створені у 20 столітті, були насправді детально описані Леонардо да Вінчі ще у 15-му столітті, наприклад, гелікоптер, глайдер і парашут. Крім того, він зробив величезний внесок в дослідження анатомії людини. Однак, найбільше «людину Відродження» ми знаємо як видатного художника. 4. Будемо сподіватись, що наші зусилля не виявляться марними. 5. Хоча ефективність чотирьохтактного двигуна внутрішнього згоряння значно підвищилась з часу його створення у 1870-х роках, його базова концепція є такою ж самою сьогодні.

24.3. Write down as many derivatives to the words from the text as possible:

existing, engineer, connective, surgery, to create, to reduce, reliable, measurement, relatively, recipient, collaboration.

24.4. Replace the words in italics with the most suitable words from the box. Note that some words in the box are extra.

to give	quality	a method	to minimize	to result in	accurate	to create
to take	quick	a researcher	to result from	a possibility	to grow	

1. Heavy snowfalls *caused* delays of all trains in the region. 2. When you are *constructing* a model, the first step is to find a good idea. 3. Steel-making *requires* around-the-clock work, seven days a week. 4. *Scientists* are sure that more sharing of research data will *yield* benefits to both scientists and economies. 5. This University offers ample *opportunities* for students to learn, grow and thrive in the 21st century economy. 6. If you need a *rapid* answer – just look on the Internet. 7. Radiocarbon dating is one of the most commonly used *techniques* for dating the remains of organic materials. 8. If you want to *reduce* the risk of heart disease, exercise regularly and eat healthy food.

PRACTICE

24.5. Rewrite the sentences using a different pattern as follows: *The implant weighs less than 5 grams. – The weight of the implant is less than 5 grams.* **For more information see also Appendix 1.**

1. The Channel Tunnel is 31.4 miles long. 2. The up quark, the smallest of all known quarks, weighs approximately 2 mega electron volts (MeV). 3. The Eiffel tower is 324 metres (1,063 ft) high, about the same height as an 81-storey building. 4. To avoid heat loss, the thickness of insulation in heating systems should be minimum 1–1.5 inches. 5. The age of these fossils is about 5 million years. 6. The width of an A4 piece of paper is 21 cm. 7. The length of the Great Wall of China is a little less than 9,000 km. 8. The deepest point in the earth's oceans, the Mariana Trench, is 11,034 meters deep.

GRAMMAR FOCUS

24.6. Note different functions of V-ing forms in the text. Find all occurrences of V-ing in the text and classify them as follows:

acting as a noun	**attribute**	**modifier**	**progressive action**
rupturing of the aorta	the existing solution	eliminating the need	... is listening

Determine the function of V-ing in the text below and translate it into your native language.

Air conditioning as we know it today began in 1902, but it had nothing to do with human comfort. New York's Sackett & Wilhelms Lithographing and Printing Company became frustrated with varying humidity levels when trying to print in colour. The same paper had to be printed four times in four colours, and if the humidity changed between print runs, the paper would slightly expand or contract. Even a millimetre's misalignment looked awful. The printers asked heating company Buffalo Forge to devise a system to control humidity. A young engineer called Willis Carrier figured out that circulating air over coils that were chilled by compressed ammonia maintained the humidity at a constant 55%. Buffalo Forge was soon selling Willis Carrier's invention wherever humidity posed problems, such as to flour mills and the Gillette corporation, where excessive moisture rusted the razor blades. These early industrial clients didn't much care about making temperatures more tolerable for their workers – that was an incidental benefit. But by 1906, Carrier was exploring the potential for "comfort" applications in public buildings like theatres.

FOLLOW UP

24.7. Learn about other technologies that have changed their initial industrial purpose to serve human comfort and wellbeing. Make a short report.

UNIT 25. ENGINEERED BACTERIA CAN FILL CRACKS IN AGING CONCRETE

PRE-READING

Think of and make a list of positive and negative effects of different kinds of bacteria. In what spheres of human life or activity can they be mostly found?

ACTIVE VOCABULARY

concrete	цемент	to tune	налагоджувати
glue	клей	to germinate	проростати
to patch up	латати, лагодити	quorum sensing	почуття кворуму
to deteriorate	погіршуватись	filament	волокно
to custom-design	проектувати за індивідуальним замовленням	to proliferate	розповсюджуватись

to burrow	ховатися в норі	to deploy	розміщувати; використовувати
to harden	міцніти	to raze	руйнувати, зносити

READING

25.1. Read the text and answer the questions.

Researchers at the University of Newcastle in the UK have created a new kind of concrete glue that can patch up the cracks in concrete structures, restoring buildings that have been damaged by seismic events or deteriorated over time. But the glue isn't an adhesive or some kind of synthetic material; the researchers have custom-designed bacteria to burrow deep into the cracks in concrete where they produce a mix of calcium carbonate and a special bacteria glue that hardens to the same strength of the surrounding concrete.

"BacillaFilla," as the researchers call it, is a genetically modified version of Bacillus subtilis, a bacterium commonly found in common soil. The researchers have tuned its genetic properties such that it only begins to germinate when it comes in contact with the highly-specific pH of concrete. Once the cells germinate, they are programmed to crawl as deep as they can into cracks in the concrete, where quorum sensing lets them know when enough bacteria have accumulated.

That accumulation lets the bacteria know they've reached the deepest part of the crack, at which point the cells begin to develop into bacterial filaments, cells that produce calcium carbonate, and cells that secrete a kind of bacterial glue that binds everything together. Once hardened, the bacteria are essentially as strong as the concrete itself, restoring structural strength and adding life to the surrounding concrete.

The bacterium also has a self-destruct gene that **keeps it from wildly proliferating** away from its concrete target, because a runaway patch of bacterial concrete that continued to grow despite all efforts to stop it would be somewhat annoying. The researchers hope their BacillaFilla will improve the longevity of concrete structures, which can be environmentally costly to erect. It could also be deployed in earthquake stricken zones to quickly reinforce damaged buildings and reduce the number of structures that have to be razed after a disaster.

1. What material can be restored using the modified bacteria? 2. Under what conditions do the bacteria begin to germinate? 3. What happens when the bacteria

reach the deepest point of the crack? 4. What helps to stop the growth of the bacteria? 5. Where is the bacterium Bacillus subtilis found in nature?

SPEECH PATTERNS

25.2. Analyse the pattern and translate the sentences into English using the pattern.

to keep smb. / smth. **from** V-ing	перешкоджати (не дати) комусь / чомусь зробити щось
The noise kept me from sleeping.	Я не міг спати через шум.

1. Щоб овочі не зіпсувались, їх обробляють спеціальним розчином. 2. Навіть тонкий шар фарби може захистити метал від ржавіння. 3. Одяг з цієї тканини не дасть вам замерзнути взимку. 4. Британські вчені винайшли метод виробництва, який не дозволяє молочному шоколаду танути навіть при 40 ^{0}C. 5. Обов'язково вдягайте гумові рукавички в хімічній лабораторії. Це захистить ваші руки від пошкоджень.

VOCABULARY

25.3. Find the synonyms to the following words in the text and in the puzzle. The words can go in all directions including diagonal.

A researcher; to solidify; usually; a feature; to connect; an aim; an endeavor; to make better; durability; to strengthen; to decrease.

T	E	V	O	R	P	M	I	Z	Y
S	R	P	R	O	P	E	R	T	Y
I	L	E	L	R	F	D	I	D	Y
T	T	R	I	F	E	V	N	L	B
N	Y	A	O	N	E	D	N	I	H
E	Y	R	R	G	F	O	U	A	B
I	T	P	N	G	M	O	R	C	M
C	Z	O	G	M	E	D	R	T	E
S	L	B	O	L	E	T	Y	C	Z
B	Y	C	N	N	G	D	M	T	E

25.4. Find the following words in the text and explain their meaning in the context. Think of different meanings of the same words. Compose sentences with the new meaning of the same words.

Kind, concrete, strength, call, once, point, cell, life.

GRAMMAR FOCUS

25.5. Note the functions of the verb *have* in the text.

Pattern	**Function**	**Example**
have + V-III	a completed action (V)	Researchers have created a new kind of concrete glue.
have + Noun	possessing something (Noun)	The bacterium also has a self-destruct gene.
have + *to* + Infinitive	a necessary action (Infinitive)	... structures that have to be razed ...

Find all occurrences of the verb *have* in the text and define its function.

Translate the sentences using the verb *have*.

1. Щоб визначити вік дерева, вам треба його зрізати і порахувати кільця у його стовбурі. 2. У Швейцарії є п'ять атомних електростанцій, які виробляють третину енергії, потрібної для країни. 3. В Йорданії щойно відкрився науковий центр з потужним прискорювачем частинок. 4. Перша екзопланета була знайдена у 1995 році, і з тих пір було відкрито тисячі інших. 5. Незважаючи на свою назву «centipede», що означає «100 ніг», ця комаха може мати від 15 до 177 пар ніжок. 6. Якщо ви збираєтесь подорожувати літаком easyJet, ви маєте подбати, щоб ваш багаж не перевищував встановлені розміри. 7. Якщо ви маєте дефіцит заліза у вашому організмі, це може спричинити відчуття втомленості. 8. За останні 100 років рівень світового океану підвищився на 10-20 сантиметрів. 9. Окрім професійних навичок, вам потрібні ще деякі якості, які не мають відношення до вашої професії, наприклад, вміння вчитися, креативність тощо. 10. На сьогодні пошукові системи досягли безпрецедентного рівня точності.

FOLLOW UP

25.6. Learn about various ways of restoring objects in your field of study or work and make a short report.

UNIT 26. WALKING ON WATER

PRE-READING

Name the three basic states of matter. What physical parameters control transition from one state to another? Give the values of these parameters for known substances, e.g. water, mercury, nitrogen, iron, as follows: *Water evaporates at 100 ^0C.*

ACTIVE VOCABULARY

a liquid	рідина	to dash	нестись, мчати
a solid	тверде тіло	to reveal	виявити
to stay put	залишатись на місці	to smack	ляпати, ляскати
a goop	пастоподібна речовина	a rod	пруток
cornstarch	кукурудзяний крохмаль	to squeeze	стискати, видавлювати
a concoction	суміш	a clump	купа; ком
to stir	розмішувати	to slip	ковзати; просунути
deceiving	оманливий	beneath	під
to punch	пробивати отвори	to slap	ляпати, ляскати
a wrist	зап'ясток	firm	міцний, твердий

READING

26.1. Read the text and answer the questions.

Almost anyone can tell the difference between a liquid and a solid. A liquid flows. A solid stays put. You pour a liquid and push a solid. The difference seems as clear as water and ice.

But some stuff doesn't fit neatly into either group, like the goop you get by dissolving cornstarch in water. The concoction looks like a liquid, and can be stirred gently with your hand or a spoon. But appearances are deceiving. Fill a swimming pool with the stuff, and you can run across the surface without getting wet. It's a good party trick – or a launching point for a science fair experiment.

"**If you were to punch it, you might break your wrist**," Scott Waitukaitis, a physicist from the University of Chicago says. He and other physicists study the behaviour of different states of matter to understand natural forces. After watching videos of people dashing across water-cornstarch soup, Waitukaitis decided to

investigate it. In a new study, he and a colleague reveal the science behind the stuff that's sometimes liquid and sometimes solid. The scientists smacked the liquid with a metal rod and then recorded the event using high-speed video and an x-ray camera. To understand what happened, they analyzed the data using a computer program.

The results suggest that when the rod hit the surface, the impact pushed the water molecules away. That left only the particles of cornstarch, which squeezed together acting like they were a solid. And like a solid, the clump of cornstarch stopped the metal rod.

Those observations may explain the strange suspension. When you slip your hand beneath the surface, water and cornstarch particles remain mixed together. But when you slap the mix – or run across – the water flows out and the cornstarch stands firm.

1. What is the difference between liquid and solid? 2. Is the water solution of cornstarch a liquid or a solid? 3. How did the scientists record their experiments to analyse the water-cornstarch mix? 4. Why is it possible to run across a swimming pool filled with starch solution? 5. Why can we easily stir the mixture?

26.2. Choose one of the options.

1. The article describes cornstarch which ___.
a) is a liquid b) is a solid c) combines properties of a liquid and a solid
d) changes its properties under high temperature
2. The author suggests filling your swimming pool with cornstarch and ___.
a) swimming in it b) running across its surface c) lying on its surface
d) jumping into it
3. If you dissolve cornstarch in water, it ___.
a) makes a suspension b) solidifies c) bursts d) turns the mixture red
4. To discover the properties of the wonderful substance, the scientists ___.
a) stirred the stuff with a metal rod b) punched the stuff with a rod
c) made an X-ray analysis of the stuff d) smashed the stuff with a rod
5. They used a computer ___.
a) to store the data of the experiment b) to analyse the results of the experiment
c) to calculate the number of molecules in the mixture d) to record the experiment
6. The experiment was made by ___.
a) a student from Scotland b) scientists from Chicago polytechnics

c) a group of American scientists d) an international research team
7. The scientists study the behaviour of ___.
a) different states of matter b) liquids c) solids d) micro-organisms in starch
8. When you hit a water-starch mixture with a rod, ___.
a) particles of water split into oxygen and hydrogen b) there is a big splash
c) particles of water flow away d) waves form on the surface

SPEECH PATTERNS

26.3. Analyse the speech pattern and translate the sentences using the pattern.

If you were to punch it, you might break your wrist.	Якщо б ви вдарили по ньому, ви б, напевно, зламали зап'ясток.
If things were to be done twice, all would be wise. (a British proverb)	Якщо можна було б все робити повторно, то усі були б мудрими. (Якби знав, де впаду, то соломки б підмостив.)

1. Живіть так, ніби ви завтра помрете. Вчіться так, ніби ви будете жити вічно. (Махатма Ганді) 2. Якби ви завтра виходили на пенсію, чим би ви займались? 3. Якби вам прийшлось проектувати лазер, як би ви визначили довжину хвилі, що утворюється? 4. Чим би займались програмісти, якби комп'ютери раптом зникли? 5. Якщо б ви завтра летіли в космос, які три речі ви б узяли з собою?

VOCABULARY

26.4. Try to find other words that can replace the following ones in the text.

To stay put, stuff, to fit, to look like, launching point, to dash, to investigate, to smack, to slap.

PRACTICE

26.5. Choose the appropriate word.

Non-Newtonian fluids turn into (solids / gases / plasma) when pressure is applied. To demonstrate this, (put / mix / dissolve) a quarter-cup of cornstarch with a quarter-cup of water. Try to pick up the (liquid / mixture / cup) in your hand and work it into a ball on your (wrist / palm / arm). (He / She / It) is solid and workable if you push it around. When you (jump / stop / sing), it turns to liquid. Tap it (with / into / under) your finger, then press your finger slowly into the mixture. When you move (quickly / suddenly / slowly) you allow the cornstarch molecules to separate. When you tap it,

the cornstarch (atoms / molecules / electrons) move closer together and cannot slide past each (others / other / another), creating a barrier. In most fluids, viscosity is only affected (by / on / at) temperature. These (is / are / have) called Newtonian fluids. Cornstarch and water is affected by temperature as (well / good / nice), but its level of (hardness / viscosity / activity) also depends on the force applied to it or how fast something moves through it. This (makes / does / creates) it non-Newtonian. Quicksand and ketchup are (too / also / as well as) non-Newtonian fluids.

GRAMMAR FOCUS

26.6. Note the use of the word *like* in the text. It has several uses and meanings in English.

Examples	Part of speech or use	Meaning
Most people **like** travelling.	Verb	enjoy; feel positive about
I **would like** to reserve a room in your hotel.		polite offers and requests
Do you **feel like** going out?		want
His house **looks like** a palace.	Preposition	similar to (often used with verbs *look*, *feel*, *seem*, *taste*, etc)
Gases **like** carbon monoxide or chlorine are very toxic.		such as (for giving examples)
The maximum speed of this car is something **like** 200 km/h.	Adverb	**(SPOKEN)** approximately
Large information networks usually have a **tree-like** structure.	Suffix	similar to (used at the end of a noun)
He went for a run, **like** he always does in the morning.	Conjunction	**(SPOKEN)** in the same way as (instead of *as*)
He was so pale **like** he had just seen a ghost.		**(SPOKEN)** looks like true but may not be true (instead of *as if*)
And he was, **like**, "It wasn't me who broke the window".	Filler word	**(SPOKEN)** reporting what someone has said
I, like, don't know what to do.		**(SPOKEN)** filling a hesitation pause (similar to *er*, *um* etc.)

Translate the following sentences with the word *like*. Say whether the usage is formal or informal.

1. It is known that light has a wave property; besides, it behaves like a particle. 2. Some people don't like writing Emails preferring SMSs or Twits. 3. Scientists believe that Sun-like stars are not primordial: they are the result of the breakup of binaries. 4. I don't feel like discussing this topic. 5. He has spent like $50,000 on his voyage. 6. He looked like he has been starving for weeks. 7. In the Batman movie series, Joker is a criminal with a clown-like appearance. 8. It looks like he has finished writing his song. 9. She says, she knows her sister like she knows herself. 10. Nikola Tesla considered it possible to transmit the energy from some great source of power like Niagara Falls to any desired part of the earth without the use of wires. 11. Fossil mammals, like mammoths and "saber-toothed tigers", are often incorrectly called dinosaurs. 12. It is no use doing what you like; you have got to like what you do. (Winston Churchill)

FOLLOW UP

26.7. Learn more about an unusual behaviour of some substances and make a short report.

UNIT 27. CHINA OPENS THE WORLD'S LONGEST BRIDGE OVER WATER

PRE-READING

Make a list of the biggest man-made structures you know. Where are they located? When were they built? How long did it take to build them? What is their size?

ACTIVE VOCABULARY

to surpass	перевершувати	to withstand	витримувати
to span	з'єднувати береги	an impact	удар
a peninsula	півострів	a vessel	судно, корабель
to toil	тяжко працювати	to link	з'єднувати
a pace	темп	apparently	мабуть, певно
a pillar	стовп; колона	to give up	відмовитись
state-run	державний	a bend	вигин
earthquake-proof	стійкий до землетрусів		

READING

27.1. Read the text and answer the questions.

Along with its massive high-speed rail network, China has officially surpassed the United States in yet another piece of transportation infrastructure: the world's longest sea bridge.

The new bridge spans Jiaozhou Bay, on the southern coast of China's Shandong Peninsula in northeastern China. At 26.4 miles long, it beats Louisiana's Lake Pontchartrain Causeway – the previous world-record holder – by at least 2 miles, **according to** the Guinness Book of World Records.

Chinese workers toiled at marathon pace to build the bridge in four years, starting at each side and meeting in the middle. The structure has 5,200 pillars and cost at least $2.3 billion, **according to** Chinese state-run media.

The Guinness officials say the bridge is earthquake- and typhoon-proof, and designed to withstand the impact of a 300,000-ton vessel. It links the port city of Qingdao to the island of Huangdao, cutting drive time from 40 to 20 minutes, **according to** the state-run China Daily.

The New Orleans Times reports that Americans are apparently not giving up the world's longest title without a fight, however. The newspaper talked to Carlton Dufrechou, general manager of the Lake Pontchartrain Causeway, who pointed out that the Jiaozhou bridge has a bend in it, and that the over-water length is only 16 miles, compared to 24 for his bridge.

1. How long is the new bridge in China? 2. What newspapers reported the details about the new bridge? 3. What are the major strength characteristics of the China's new bridge? 4. How long did it take to build the bridge? 5. How many pillars does the bridge stand on?

SPEECH PATTERNS

27.2. Analyse the speech pattern and translate the sentences using the pattern.

according to	1) відповідно до чогось; 2) за повідомленням
According to the dictionary, the verb *run* has more than 20 meanings.	Відповідно до словника, дієслово *run* має більше 20 значень.
According to his teacher, he was the best student in the group.	За словами його вчителя він був найкращим студентом в групі.

1. За повідомленням журналу «Нью Сайентіст» таємниця вічних вогнів, що горять в Туреччині протягом тисячоліть, вже розкрита. 2. З точки зору сучасної фізики матерія складається з елементарних частинок, які служать будівельними блоками. 3. За грецькою легендою наша Земля (грецькою – Гея) народилась з хаосу, первинної субстанції. 4. За повідомленнями НАСА серпень 2014 року був найтеплішим місяцем за всю історію. 5. На думку спеціалістів з американського фізичного товариства графен – це унікальний матеріал, в мільйон разів тонший за папір, міцніший за діамант та більш електропровідний ніж мідь.

VOCABULARY

27.3. Choose one of the options to substitute the underlined word.

1. Some man-made fibres surpass natural ones.
a) give up b) withstand c) exceed d) bend
2. The weather is apparently going to change soon.
a) recently b) evidently c) actually d) generally
3. When a meteor impacts the Earth either on land or water, the consequences may be very destructive.
a) bends b) toils c) spans d) hits
4. He has never given up the idea of becoming a famous artist.
a) considered b) started c) performed d) abandoned
5. These events were all subtly linked together.
a) connected b) conserved c) designed d) compared
6. This alloy is designed to withstand high pressure and temperature.
a) obey b) resist c) avoid d) experience
7. The vessel was moving at a good pace.
a) place b) peace c) space d) speed
8. The road makes a sharp bend near the lake.
a) curve b) corner c) angle d) bow

27.4. Translate the word combinations into English:

найдовший в світі міст; перевищити на 2 милі; витримати удар; попередній рекордсмен; елемент транспортної інфраструктури; відмовитись від титулу; сейсмостійкий міст; працювати з марафонською швидкістю; збудувати міст за чотири роки; високошвидкісна залізнична мережа; книга рекордів Гінеса.

PRACTICE

27.5. Match two parts of the sentences.

1	China has	a	miles long.
2	The longest over-water bridge has	b	than the American longest bridge.
3	The bridge is 26.4	c	build in four years.
4	The workers	d	been built in northeastern China.
5	The Chinese bridge is 2 miles longer	e	links the port city of Qingdao to the island of Huangdao.
6	The Chinese bridge was	f	a highly developed high-speed rail system.
7	The bridge can	j	constructed the bridge from each side of the bay.
8	The bridge	h	withstand the impact of a 300,000-ton vessel.

GRAMMAR FOCUS

27.6. Note different structures of Noun Phrases in the text, e.g. *massive high-speed rail network* (Adjective+Adjective+Noun+Noun) or *another piece of transportation infrastructure* (Adjective+Noun+*of*+Noun+Noun).

1) Find all Noun Phrases in the text and transform non-prepositional structure into prepositional one and vice versa if possible as follows:

massive high-speed rail network – massive network **of** high-speed rails;

the world's longest sea bridge – the longest bridge over the sea in the world.

2) Translate the following word combinations into English:

структура кристалів; довжина хвилі світла; швидкість передачі даних; розміри сталевої труби; коефіцієнт дифузії магнітного поля; автоматизоване управління інформацією; шкала корозійної стійкості; захист від аеродинамічного нагріву; рух заряджених частинок вздовж силових ліній магнітного поля; датчик рівня охолоджуючої рідини.

27.7. Find all compound words (e.g. *high-speed*) in the text. Analyse the meaning of both parts of such words and give examples of other words formed with each one. Example: *high-speed – 1) high-accuracy, high-density; 2) low-speed, average-speed.*

FOLLOW UP

27.8. Learn about and make a short report on the outstanding building structure in your city (country).

UNIT 28. LOSING WITH HEADS OR TAILS

PRE-READING

Have you ever tossed a coin to choose between alternatives? What kind of problems were they? With your neighbour, make an impromptu decision using a coin.

ACTIVE VOCABULARY

to turn out	виявлятись	to spin	крутитися, вертітися
a toss	кидання	to tip	нахилятися
a tie	зв'язок	to wobble	гойдатися, хитатися
heads	орел	an outcome	результат, підсумок
tails	решка	an angle	кут
random	довільний	odds	шанси; перевага
to flip over	перевертатись		

READING

28.1. Read the text and answer the questions.

It turns out that coin tosses may be less fair than you might think. A new mathematical analysis even suggests a way to increase your chances of winning.

People use coin tosses all the time to make decisions and break ties. You've probably done it yourself to decide who gets the last piece of pizza or which team gets the ball first. Heads or tails? It's anybody's guess, but each side is supposed to have an equal chance of winning.

That's not always true, say mathematicians from Stanford University and the University of California, Santa Cruz. For a coin toss to be truly random, they say, you have to flip the coin into the air so that it spins in just the right way.

Most of the time, though, the coin doesn't spin perfectly. It might tip and wobble in the air. Sometimes it doesn't even flip over.

In experiments, the researchers found that it's practically impossible to tell from watching a tossed coin whether it has flipped over. A tossed coin is typically in

the air for just half a second, and a wobble can fool the eyes, **no matter how** carefully you watch.

To see how wobbling affects the outcome, the researchers videotaped actual coin tosses and measured the angle of the coin in the air. They found that a coin has a **51 percent chance** of landing on the side it started from. So, if heads is up to start with, there's a slightly bigger chance that a coin will land heads rather than tails.

When it comes down to it, the odds aren't very different from 50-50. In fact, it would take about 10,000 tosses for you to really notice the difference.

1. Why do people toss a coin into the air? 2. How long is the tossed coin in the air? 3. What bothers you to tell whether a tossed coin has flipped over? 4. What is the chance that a coin will land on the same side which it started from? 5. Who made the experiments with tossing a coin?

28.2. Complete the sentences based on the information from the text.

1. Tossing the coin may appear less fair than ___. 2. People toss the coin in order to ___. 3. There are two sides of the coin: ___. 4. When we toss the coin, it is impossible to tell ___. 5. The researchers videotaped the tossing of the coin in order to ___. 6. The researchers observed that ___. 7. The chances of the coin to land on the same side are ___.

SPEECH PATTERNS

28.3. Analyse the speech patterns and translate the sentences into English using the patterns.

51 percent chance	**51-процентний шанс**
He lives in a 5 **storey** building.	Він живе у п'ятиповерховому будинку.

A. 1. Австралієць Тім Коуп здійснив 10000-кілометрову подорож з Монголії до Угорщини верхи. 2. На двадцятидоларовій банкноті зображений сьомий президент США Ендрю Джексон. 3. На будівництві працюють крани вантажопідйомністю 200-300 тон. 4. Найбільшим попитом користуються 60-ватні лампочки розжарювання. 5. Цей 125-сторінковий порадник користувача містить детальну інформацію про заходи безпеки, складання, установку, настроювання та інше.

No matter (how, what, when ...)	**Незалежно від того (як, що, коли ...)**
No matter what they say, do your own choice.	Щоб вони не казали, робіть свій власний вибір.
No matter the age, people should take care of their health.	Незалежно від віку люди мають піклуватись про своє здоров'я.

B. 1. Ви можете отримати доступ до цих Інтернет ресурсів незалежно від того, де ви живете. 2. Незалежно від віку людина має постійно навчатись. 3. Як би він не намагався, в нього не виходить вимовляти ці звуки. 4. Незалежно від мови програмування, є принципи, які є загальними для всіх мов. 5. Якою б довгою не була ніч, день обов'язково прийде.

When it comes down to ...	**Коли справа доходить до ... (Коли йдеться про ...)**
Good health comes down to three things: breakfast, lunch and dinner :)	Добре здоров'я зводиться до трьох речей: сніданок, обід та вечеря.

C. 1. Коли йдеться про їжу, то її колір має значення. 2. При виборі місця навчання та спеціальності все врешті зводиться до грошей. 3. Коли мова заходить про цю тему, він завжди мовчить. 4. Коли йдеться про рівень елементарних частинок, то там панує квантова механіка. 5. Причина низької ефективність багатьох освітлювальних систем зводиться до того, що частина енергії марно витрачається на тепло.

VOCABULARY

28.4. Some words have the same pronunciation but they have different meaning and spelling, e.g. *knew – new*, *see – sea* etc. There are at least 14 such words in the text above. 1) First, find them all, write down their phonetic "twins" with different spelling and compose the sentences of your own with these words. 2) Fill in the gaps in the following sentences with suitable words. The transcription will help you.

1. When I ___ my bicycle two days ago the ___ was blocked by the strike of lorry drivers. [rəud] 2. The whole ___ the ___ was fighting with the dragon. [nait] 3. It was ___ that the ___ with a damaged engine had to land immediately. [plein] 4. If you want to go ___ from France to Britain you can use the Channel Tunnel under the ___

of Dover which lies at an average depth of 45 m (150 feet) below the seabed. [streit] 5. Tom had to hit the ___ pedal not to ___ his car against the fence. [breik] 6. Somebody tried to ___ a long bar of ___ from the foundry. [sti:l] 7. It was a ___ idea to ___ some cheese into this salad. [greit] 8. During the first ___ after the surgery he was too ___ to even walk. [wi:k] 9. ___ doubt, you ___ the law of conservation of energy. [nəu] 10. I have ___ that the ___ List of Threatened Species was founded by the International Union for Conservation of Nature (IUCN) in 1964. [red] 11. You have to ___ your sources when you write a paper. A crawler crane cannot be easily moved from one job ___ to another without significant expense. Eye surgeons warn that using smartphones may cause ___ problems. [sait] 12. A standing wave, or a ___ wave, is a wave that has parts that remain in a constant position. This company has been supplying office and school ___ for more than a decade. [ˈsteiʃən(ə)ri]

PRACTICE

28.5. **Complete the sentences with the correct form of the words from the box. Note that some words in the box are extra.**

to measure	*slightly*	*equal*	*to decide*	*random*	*to land*	*typically*
impossible	*carefully*	*to suppose*	*to toss*			

1. This programme generates ___ numbers in the specified range. 2. A barometer ___ the atmospheric pressure. 3. This furniture is crafted using ___ selected materials and modern factory equipment. 4. An isosceles triangle has two ___ sides. 5. The airplane has ___ safely. 6. The company ___ to enhance pollution control. 7. This work ___ great skill. 8. These jobs ___ require a bachelor's degree.

GRAMMAR FOCUS

28.6. Note that adverbs in the text have two patterns: *-ly* adverbs and plain adverbs. Adverbs are used to supply additional quality to Adjectives and Verbs in contrast to Adjectives that attribute Nouns. 1) Find all adverbs in the text and note their position in the sentence. 2) In the following sentence choose between an Adverb and Adjective and put them into the proper place.

1. On the ground, the sloth moves at an average speed of 0.037 m/s, slower than the giant tortoise, which walks at 0.076 m/s. (considerable / considerably) 2. We have witnessed a growth of gold price over the years. (considerable / considerably) 3. Polar conditions are changing, impacting weather across the globe. (dramatic / dramatically) 4. Governments should jointly decide to reduce greenhouse gas emissions from the

combustion of fossil fuels by switching to renewable sources of energy. (dramatic / dramatically) 5. Cold, damp roads can have an impact on the performance of tyres, leading to an increased accident risk. (dramatic / dramatically) 6. Mirage effect can be explained by physics: when light waves move from an area of colder air into a hotter area, they bend away. (dramatic / dramatically) 7. Galaxies are comprised of several hundred billion stars and display a variety of shapes and sizes. (typical / typically) 8. The structure of a bacterial cell is shown in Figure 1. (typical / typically) 9. Do you answer online poll questions? (typical / typically)

FOLLOW UP

28.7. Learn the origin of the expression "heads or tails". Find out similar expressions in other cultures and report to the class? What are other ways of choosing?

UNIT 29. RESEARCHERS CREATE NEW MATERIAL THAT MAY BE WORLD'S HARDEST

PRE-READING

Individually, write down five materials and arrange them according to their hardness. Report your ideas to the class using the patterns: *X is the hardest material. Y is less hard than X. X is much harder than Y. Z is the least hard material.*

ACTIVE VOCABULARY

to scrape	шкребти	combo=combination	сполучення
a dent	вибоїна, заглиблення	an anvil	ковадло
peril	небезпека	to squeeze	стискати
a materials scientist	матеріалознавець	to exert	діяти, впливати
to arrange	розташовувати	dense	щільний
to resemble	нагадувати	to estimate	оцінювати
a bond	зв'язувати	super-heavy-duty	надміцний
to space	залишати проміжки	sandpaper	шмерґель (наждак)

READING

29.1. Read the text and answer the questions.

Diamonds have long been considered the world's hardest material. Scrape one across any surface, and it will leave a scratch. Press one into any surface, and it will make a dent. But the prized mineral's record status now appears in peril: Researchers have created a new material that may be even harder than diamond.

Key to the team's success: Pressure. Lots of it, explains Lin Wang, who works for the Carnegie Institution of Washington in Argonne, Ill. As a materials scientist, Lin studies how the structure of materials at the atomic and molecular scale relates to their overall properties.

To make the super hard substance, his team began with carbon molecules called fullerenes. Each molecule contains 60 carbon atoms arranged in a pattern that resembles a ball-shaped cage. In fact, **if you were to draw a fullerene molecule and also draw all of the chemical bonds that hold its atoms together, each fullerene would look just like a soccer ball**.

The researchers then added a carbon-rich liquid called xylene to the fullerenes. The carbon atoms in each xylene molecule are arranged in a ring. Xylene molecules weakly link to the fullerenes and so help keep those ball-shaped molecules spaced a certain distance apart, Wang explains.

Finally, the researchers put the combo into a machine called a diamond anvil cell. Made from two tiny, flat pieces of polished diamond, it could squeeze the fullerene-xylene mixture at very high pressures. The anvil's squeeze on that new material exerted about **320,000 times the pressure** that Earth's atmosphere exerts at sea level. That's about the same pressure as the weight of 300 elephants on a single postage stamp! The result: The fullerene cages began to collapse and break apart. That created a new structure that became exceptionally dense and hard, Wang explains.

When the researchers took the samples out of their diamond anvil cell, they noticed that the tiny diamonds that had been used to squeeze the samples were cracked. That's a clue that the compressed version of the fullerene-xylene mixture is harder than diamond, Wang and his co-workers reported in the August 17 (2012) issue of the journal Science. Current computer analyses of materials can't help estimate how hard the new material is compared with diamond, so for now only tests of actual samples can reveal the answer.

The samples of super hard material that Wang and his team created are very small – no more than 200 micrometers across, or a distance about twice the thickness

of a sheet of paper. “We’d need different equipment to make larger samples,” says Wang. So it’s too soon to begin envisioning amazingly tough tools, such as ever-sharp saw blades or super-heavy-duty sandpaper, based on the new material.

1. Where does Lin Wang work? 2. What is he? 3. What material is his team going to create? 4. What is the source material for the new one? 5. How do they call the machine where the new material is formed? 6. What pressure is the new material exposed to? 7. How did scientists understand that the new material is harder than diamond? 8. What size are the samples made of the new material?

29.2. Choose one of the options.

1. Lin Wang studies ___.

a) the properties of atoms and molecules b) the relation between materials’ microstructure and its characteristics c) materials science d) the hardness of diamonds

2. Thanks to xylene, fullerene molecules ___.

a) become arranged in a ring b) become ball-shaped c) fall apart d) stay at a definite distance from each other

3. To squeeze the fullerene-xylene mixture the researchers used ___.

a) a special press b) two diamonds c) atmospheric pressure d) elephants

4. As a result of the experiment ___.

a) the fullerene samples cracked b) the diamond plates cracked c) the anvil cracked
d) the fullerene cages squeezed

5. a) Computer analyses proved that the new material is harder than diamond.
b) The researchers didn’t make computer analyses.
c) The researchers will test the new material again without computer analyses.
d) Computers are not currently used for analyses of materials.

6. The researchers need some other equipment ___.

a) to study different material b) to create big samples of the new material
c) to produce diamonds artificially d) to make samples as thin as paper

7. a) The new material is used to produce durable tools.
b) The researchers envision that the new material will be very useful.
c) The new material will be introduced very soon.
d) The researchers think that their duties are heavy.

SPEECH PATTERNS

29.3. Analyse the speech patterns and translate the sentences using the pattern.

If you were to draw ..., ... would look = if you drew ..., ... would look	якщо б ви намалювали ..., ... виглядав би
If you were to see a lion, what would you do?	Якщо б ви побачили лева, що б ви зробили?

A. 1. Якщо б вам довелось починати вчитись з початку, що б ви змінили? 2. Якби ви збирались у навколосвітню подорож, ви б зрозуміли, як складно обрати найнеобхідніші речі. 3. Якби ви писали книгу, про що б вона була? 4. Якби ви запустили цю програму на більш потужному комп'ютері, ви б одразу відчули різницю. 5. Якщо б зникло магнітне поле Землі, то більшість живих організмів загинули б.

320,000 times the pressure ...	тиск у 320000 разів більший ніж ...
Sun is about 109 times the diameter of Earth.	Діаметр Сонця у 109 разів більший, ніж діаметр Землі.

B. 1. Маса Землі приблизно в 10 разів більша за масу Марса. 2. Атмосферний тиск на Землі майже в 100 разів вищий за тиск на Марсі. 3. Діаметр Землі майже вдвічі більший за діаметр Марса. 4. Сила тяжіння на Землі майже втричі більша, ніж на Марсі. 5. Період обертання Марса майже вдвічі більший за земний.

VOCABULARY

29.4. Fill in the gaps with the following words: *molecule, tiny, property, pressure, dense, liquid, to contain, to estimate, to create, to arrange*. Change the form of the word if necessary. Give synonyms to these words if possible.

1. It is hard ___ the efficiency of this method without thorough analysis. 2. Air ___ impacts the weather and climate of an area. 3. Mendeleev ___ elements in the table according to their atomic weights. 4. All flights were delayed due to ___ fog that fell on the city. 5. The three basic ___ of matter are volume, mass, and shape. 6. A ___ of water ___ two atoms of hydrogen and one atom of oxygen. 7. There are five main states of matter: solid, ___, gas, plasma, and Bose-Einstein condensate. 8. Electrons are so ___ that they make up only 1% of an atom's mass. 9. According to the law of conservation of energy, it can be neither ___ nor destroyed.

GRAMMAR FOCUS

29.5. Put one of the following auxiliaries into each gap*: a) was, b) have, c) were, d) is, e) do, f) are, g) does, h) will, i) has.*

1. The hardness of the new material ___ not been estimated yet. 2. Diamonds ___ used not only as jewellery but also for industrial and research purposes. 3. The sample created ___ not exceed 200 micrometers across. 4. Larger samples of the new material ___ be made with different equipment. 5. The results of the experiment ___ published in the journal Science. 6. What objects ___ fullerene molecules resemble? 7. In the experiment, a special machine called a diamond anvil cell ___ used. 8. People ___ long been thinking of diamond as a hardest material. 9. A fullerene molecule ___ composed of 60 carbon atoms.

FOLLOW UP

29.6. Find the information on the most recent research in materials science concerning other types of super-strong materials. Report your findings to the class.

UNIT 30. OPPORTUNITY BEGINS ITS 10TH YEAR OF MARS ROVING

PRE-READING

In pairs: Write down 3 questions about the Solar system and its planets and put them to your neighbour. If they cannot answer the question readdress it to the class.

ACTIVE VOCABULARY

opportunity	можливість	to figure out	зрозуміти
elsewhere	в іншому місці	a rim	край
contribution	внесок	clay	глина
defunct	вимерлий	to log	занести в судовий журнал
indication	вказівка	wear and tear	зношування
to stick (stuck)	застрягнути	to overtake	обігнати
simulation	моделювання	headline	заголовок

READING

30.1. Read the text and answer the questions.

(1) Today on Mars the robotic rover Opportunity (that's right, Opportunity – remember when we all **used to** care about Opportunity?) is hitting a major milestone. The rover touched down on the surface of Mars on January 24, 2004, just three weeks after its sister rover Spirit landed elsewhere on the planet. That makes today the beginning of Opportunity's tenth year of Mars exploration – not bad for a machine that was designed for a three-month mission.

(2) Spirit and Opportunity were sent to the Red Planet in search of signs of its hydrological history (and, therefore, potential past life). Spirit made perhaps its biggest contribution in 2007 when it uncovered a long-defunct hydrothermal system in Gusev crater, an indication that Mars **was once home to** both liquid water and an energy source, key ingredients for life as we understand it. But in 2010 it became stuck in a bed of soft sand and couldn't reorient its solar panels in a way that would allow it to survive the Martian winter. Attempts to revive it during the Mars spring of 2011 failed and it was pronounced dead.

(3) Opportunity enjoyed its own brush with death back in April of 2005 when it too became stuck in a sand dune. NASA mission operators spent weeks doing simulations back on Earth before finally figuring out how to rock Opportunity free and get it moving across the surface again – and it continues to roll to this day. It is currently exploring the rim of Endeavour Crater, a geological environment rich in clay deposits that may have once been capable of supporting microbial life.

(4) Both rovers, of course, far outlived their three-month design lives. Opportunity has now logged 22.03 miles on Mars since touching down, and with the exception of some expected wear and tear, engineers say the rover is still in excellent shape. In fact, Opportunity very well may soon overtake the Soviet lunar rover Lunokhod 2 for the all-time record for longest distance traveled on another planetary body (Lunokhod 2 traveled 23 miles across the moon in 1973). By comparison Mars Rover Curiosity, even with its tendency to dominate the headlines, still has a long way to go.

1. When did the rover Opportunity landed on Mars? 2. What was the rovers' mission? 3. Is the rover Spirit sill moving? 4. What happened with Opportunity in April of 2005? 5. What is Opportunity exploring now? 6. What distance has Opportunity covered to date?

30.2. Match the following headlines with paragraphs (1-4).

A. Greatest discovery. B. Record-breaking. C. Celebration day. D. Overcoming challenges.

SPEECH PATTERNS

30.3. Analyse the speech patterns and translate the sentences using the pattern.

used to (do smth.)	робити щось постійно у минулому
He used to come earlier than everybody else.	Він звичайно приходив раніше за інших.

A. 1. Раніше люди писали листи, а зараз вони частіше надсилають SMS-ки або телефонують. 2. В цій річці колись було багато риби. 3. До ери Інтернету науковці шукали інформацію у бібліотеках. 4. До того як винайшли електрику, трамваї тягнули конями. 5. Спочатку всі автомобілі, що виготовлялись на заводах Форд, були чорного кольору.

Mars was once home to water.	На Марсі колись знаходилась вода.
Britain is home to about 60 million people.	В Британії проживають біля 60 мільйонів людей.

B. 1. В Азії проживає половина населення Землі. 2. В Австралії є понад 20 різних видів черепах. 3. В людському організмі знаходяться понад 100 трильйонів «добрих» бактерій. 4. В цьому місті знаходяться знамениті музеї, театри та виставкові центри. 5. В нашому університеті проводяться інноваційні наукові дослідження.

VOCABULARY

30.4. Find the English equivalents in the text:

витратили тижні на моделювання; набагато перевищити запроектований термін дії; в пошуках ознак; досягти важливої віхи; бути на межі смерті; намагання ... не вдались; поклади, які, можливо, колись були здатні підтримувати життя; бути в чудовій формі; приземлитись в іншому місці; очікуване зношування; неперевершений рекорд; тримісячна місія.

30.5. Match the following words from the text (list A) with their synonyms (list B). Note that there are nore words in the list (B) than in the list (A).

A) Major, exploration, mission, indication, an ingredient, simulation, to figure out, currently, expected (tear).

B) Component, final, percentage, to understand, modelling, invention, crucial, a signal, always, today, predicted, extinction, operation, to destroy, study.

PRACTICE

30.5. There are three vehicles mentioned in the text: a) rover Opportunity, b) rover Spirit and c) Lunokhod 2. Say which one is meant in the following sentences. Formulate your answers as follows: *It landed on Mars in 2004. - It is Opportunity that landed on Mars in 2004.*

1. It stuck in sand forever. 2. It successfully landed on Mars three months after its "sister". 3. It was rolling across the Moon. 4. Engineers made simulations trying to save it. 5. It is still moving. 6. Engineers couldn't fix the problems with it. 7. It found the evidence that there once had been water on Mars. 8. It was built in the Soviet Union. 9. It may break the record of the longest distance covered by an extraterrestrial land vehicle.

GRAMMAR FOCUS

30.6. Note combinations of Prepositions with Verbs and Nouns. Insert the proper preposition into the word combinations from the text. Translate them into your native language. Compose a sentence of your own with each combination.

to care ___ (opportunity); to be designed ___ (three-month mission); to send ___ (the Red Planet); ___ search ___ (signs of hydrological history); to be home ___ (liquid water); to figure ___ (how to rock it free); to move ___ (the surface); to be rich ___ (clay); to be capable ___ (supporting life); ___ the exception ___(some tear and wear); ___ comparison.

FOLLOW UP

30.7. Learn about other missions to Mars. Report to the class.

UNIT 31. NANOTUBE PAINT

PRE-READING

1. Make a list of possible use of paint. Report to the class using the phrases like *Paint is used (designed) for + V-ing* or *Paint is used (designed) to + V*.
2. What methods of detecting damages do you know? How do they work?

ACTIVE VOCABULARY

to detect	виявляти	a transmitter	передавач
to alert	попереджувати	conceivably	можливо
to occur	траплятись	to incorporate	включати (до складу)
facility	установка, об'єкт	harvesting	накопичення
a mine	шахта	combustion	горіння
aligned	вирівняний	a landfill	звалище
fly ash	летюча зола	durability	міцність, довговічність
to bend	викривлятись	to repair	ремонтувати

READING

31.1. Read the text and answer the questions.

A new paint made of power plant waste and carbon nanotubes can automatically detect structural faults, alerting authorities before damage occurs. It could be a cheaper, easier way to monitor facilities like bridges, mines and even wind turbines.

It's made from aligned carbon nanotubes, which can carry an electric current, and fly ash, which is a byproduct of coal burning. The paint can be sprayed onto any surface, and electrodes are attached to it, according to developers at the University of Strathclyde in Glasgow. If the nanotubes bend, their conductivity will change, which will be detected by the electrodes. Small wireless transmitters placed throughout the structure would receive data from the electrodes. If they detect a change in conductivity, this would be considered a sign of a defect in the structure. Then the system could conceivably alert the company or government body responsible for maintaining the said structure.

For now, the electrode transmitters would be powered by batteries, but other designs could incorporate solar panels, piezoelectrics or other energy-harvesting technology.

Fly ash is a byproduct of coal combustion and it's generally stored at power plants and landfills or it's recycled. The nanotube paint could be one new use for it. It also **lends the paint some added durability**, which means it could last in a wide range of environmental conditions.

The new technology would be much cheaper and simpler than current monitoring methods, scientists say. Currently, wind turbine foundations are inspected visually, and bridges and tunnels only have monitoring networks in certain areas, not throughout the whole structure. Early defect detection could be cheaper to repair, **not to mention** safer.

1. What is the new paint made from? 2. How are the damages of the painted constructions detected? 3. What power sources can be used for the electrode transmitters? 4. What is normally done with fly ash at power stations? 5. In what way do they monitor damages of bridges, wind turbine foundations and tunnels today?

31.2. Choose one of the options to complete the sentences.

1. Fly ash forms ___.

a) when people smoke b) as a byproduct of metal production c) as a result of burning coal d) as a result of volcanic activity

2. Due to fly ash, the paint ___.

a) is easier to remove b) becomes more durable c) becomes more environmentally friendly d) better conducts electricity

3. Solar panels can be used ___.

a) to test the paint b) to protect people from the sun c) to facilitate the paint drying
d) as a power source for electrode transmitters

4. The research is conducted in ___.

a) Italy b) the UK c) the USA d) the Netherlands

5. The transmitters ___.

a) are put all over the controlled structure b) enter into the paint's composition
c) send data every second d) detect the change in conductivity

6. The new technology is a cheaper way ___.

a) to utilize fly ash b) to produce electricity c) to apply paint to bridges and tunnels

d) to register defects in complex constructions

7. Transmitters send the signal to the control body ___.

a) when somebody hacks into the controlled structure b) through fibre-optic cables

c) wirelessly d) intermittently

8. A defect in the structure is detected when ___.

a) the paint changes its colour b) the electricity is not conducted through the paint properly c) the nanotubes align d) the paint peels

SPEECH PATTERNS

31.3. Analyse the speech pattern and translate the sentences using the pattern.

lend the paint some added durability	надає фарбі додаткової міцності (додає міцності фарбі)
Chocolate lends the desert its unique flavour.	Шоколад надає десерту неповторного смаку.

A. 1. Посилання на літературу надає більшої достовірності вашій статті. 2. Окуляри додали серйозності його обличчю. 3. Місячне сяйво додавало річковому пейзажу романтизму. 4. Чавун містить багато домішок, які надають йому хрупкості. 5. Це покриття надає поверхні необхідну шорсткість та підвищує коефіцієнт тертя.

not to mention smth. / smb.	не кажучи вже про щось / когось; а також
He has bad command of his own language, not to mention any foreign language.	Він погано володіє своєю рідною мовою, не кажучи вже про якусь іноземну.

B. 1. В університеті ви отримаєте глибокі знання, навички вчитись, а також добрих друзів. 2. Вона ніколи не була у великому місті, не те що закордоном. 3. Порівняно з автомобілем, велосипед значно дешевший, легший в керуванні та догляді, і, що не менш важливе, екологічно чистий вид транспорту. 4. Надмірне використання комп'ютера може викликати багато проблем зі здоров'ям, таких як головний біль та очні захворювання, а також психологічні розлади. 5. Їхня квартира схожа на звіринець. В них є 3 кішки, 4 собаки, 2 папуги, хом'яки і на додаток – акваріумні рибки.

PRACTICE

31.4. Put the processes to detect damages, described in the text, in the correct order. Describe the whole process using expressions of sequence: *Firstly, First of all, To begin with, Initially, The first step is __, __ begins with, Secondly, Thirdly etc, When this happens, Next, Then, Subsequently, After this, Following this, Eventually, Finally, In the last stage.* **For more practice on Sequencing see Appendix 1.**

1. Electrodes detect the variation of conductivity. 2. The signal from the transmitters is sent to a control body. 3. There appears a crack on the surface of the object. 4. Nanotubes' conductivity changes. 5. The paint containing nanotubes is sprayed onto the surface of the controlled object. 6. Electrodes send data to transmitters. 7. Nanotubes bend. 8. The electrodes are attached to the surface under control.

VOCABULARY

31.5. Match two parts of the collocations. Compose sentences of your own using the obtained word combinations.

1	to detect	a	a file to an email
2	to alert	b	used plastic bottles
3	to occur	c	forward and backward
4	to align	d	cracks and scratches on the surface
5	to attach	e	the car with electric motor
6	to bend	f	the text to the left
7	to power	g	the broken bicycle
8	to store	h	the police in case of emergency
9	to recycle	i	data to a hard disk
10	to repair	j	in nature

GRAMMAR FOCUS

31.6. Find in the text the sentences with modal verbs that express Ability, Probability, Repeated (Constant) Action. Compose sentences of your own using these modal verbs.

31.7. Note the use of Conditional clause in the sentence: *If the nanotubes bend, their conductivity will change.* **Note that when we speak about future and the condition is quite possible, the *if*-clause uses the Present tense, while the main**

clause is formulated either with Future tenses or with Imperative. Complete the sentences below.

1. If the interview starts on time, ___. 2. If you don't completely fill out the form, ___. 3. If your article contains too many mistakes, ___. 4. If water is heated to 100^0C, ___. 5. If you add water to sulphuric acid, ___. 6. If you do not install antivirus software on your computer, ___. 7. If you spend too much time sunbathing, ___. 8. If technology advances at the same rate, ___.

FOLLOW UP

31.8. Learn about other uses of nanotechnology. Report to the class.

UNIT 32. HOW LIGHTHOUSES WORK

PRE-READING

"In an effort to preserve the history and aesthetics of lighthouses, the National Historic Lighthouse Preservation Act of 2000 outlines a process in which the Coast Guard transfers certain decommissioned lighthouses to nonprofit groups and other organizations at no cost, provided that the organizations maintain the structures and keep them open to the public. If no organizations claim the lighthouse, it goes up for auction" [source: https://www.nps.gov/maritime/]. In groups of 3 or 4 discuss three possible ways of using a former lighthouse and report to the class.

ACTIVE VOCABULARY

a yesteryear	минуле	to distinguish	розрізняти
a stretch	відрізок	to emit	випромінювати
an aficionado	шанувальник	an index (*pl* indices)	(алфавітний) покажчик
maritime	морський	to accommodate	розміщати
a beacon	маяк; сигнальний вогонь	cumbersome	громіздкий
treacherous	ненадійний	living quarters	житлове приміщення
a shoal	мілина	cast iron	чавун
a cannon	гармата	to go on the fritz	зламатися
a reference	орієнтир		

READING

32.1. Read the text and say whether the statements are TRUE of FALSE. If FALSE, give the correct answer.

To the weary sailors of yesteryear, it represents the final stretch – and perhaps the most hazardous portion – of a long voyage. To modern-day aficionados, it is a glimmering monument to the history of a maritime community. But **whatever meaning gets attached to it**, a lighthouse is something far simpler: a tower and a beacon.

In an era before GPS and other navigational apparatuses, lighthouses served two primary purposes. The first was illuminating waterways made treacherous by shoals, reefs, rocks and other hazards as ships left the open ocean and pulled into port. Most lighthouses also include fog signals such as horns, bells or cannons, which sound to warn ships of hazards during periods of low visibility.

The second purpose is to serve as a reference to mariners. An individual lighthouse distinguished itself with its day mark – the color schemes and patterns on the tower – and its light signature. For example, a lighthouse might emit two flashes every three seconds to distinguish it from a lighthouse that emits four flashes every three seconds. Even today, if the GPS goes on the fritz, crews reference light lists to plot a course – those regional indices of lighthouses and their distinguishing traits.

At points before their automation in the 20th century, lighthouses had to accommodate cumbersome systems as well as a light-keeping staff to keep shining 24 hours a day. In addition to a lighthouse, a complete light station might comprise a fog signal building, a boathouse, living quarters for the keeper and his family and a separate oil house to cordon off the flammable agents that powered the lamps.

No two lighthouses have been built the same. Early lighthouses used **whatever materials were available** locally: wood, brick, stone, concrete, reinforced steel and cast iron. Some lighthouses are placed onshore overlooking the water, while some are built offshore on reefs or patches of rocks. Even the height of the tower changes from one lighthouse to the next depending on the view from the water. A lighthouse overlooking a 100-foot (30.48 meter) cliff, for example, wouldn’t need to be built as tall as one positioned closer to sea level.

There are regional similarities in construction, however lighthouses built in the Outer Banks of North Carolina are built in intervals so that if a ship maneuvering down the coast lost sight of one lighthouse, it would find the glow of the next one.

1. Now when all sailors are supplied with GPSs there is no need in lighthouses any more. 2. These is one standard shining pattern for all lighthouses. 3. Lighthouses are always made of brick. 4. Most lighthouses have sound signals to warn the ships during the periods of low visibility. 5. The heights of different lighthouses may be different. 6. A lighthouse keeper never lives close to the lighthouse. 7. A lighthouse is not just one building; there are some additional facilities. 8. Lighthouses are always painted white. 9. The interval between light flashes of a lighthouse amounts to several minutes.

SPEECH PATTERNS

32.2. Analyse the speech patterns and translate the sentences using the patterns.

whatever meaning gets attached to it	яке б значення йому не приписували
whatever materials were available	всі матеріали, що були в наявності
Whatever you learn, learn to learn.	Що б ви не вивчали, вчіться вчитись.

1. Що б він не казав, не вірте йому. 2. Якою б не була погода, ми вирушаємо о сьомій ранку. 3. Я зроблю все – що б ви не попросили. 4. Якою б не була причина, він не мав права ображати людину. 5. Сьогодні ви можете купити все, що вам потрібно, онлайн.

VOCABULARY

32.3. Match the words and expressions from the text and the functions they express. Use them in the sentences of your own. For more practice on functional words see Appendix 1.

1	such as; for example	a	adding information
2	the most + *Adj.*; far + *Comp. Adj.*; even (today); whatever (materials);	b	comparing objects or qualities
3	and; also; as well as; in addition	c	contrasting objects or qualities
4	the same; as + *Adj.* + as; (there are) similarities	d	object structure
5	however; while; distinguish smth. from smth.; to change from smth. to smth.	e	exemplifying
6	include; comprise	f	emphasizing

32.4. Find the equivalents of the following words and expressions in the text:
1) відрізнятись чимось; 2) особливі характеристики; 3) підтримувати світло; 4) подавати живлення до ламп; 5) головні цілі; 6) займиста речовина; 7) висота башти залежить від ...; 8) використовувати буд-які доступні матеріали; 9) попереджувати когось про щось; 10) близько до моря; 11) звертатись до списків; 12) втратити з ока.

PRACTICE

32.5. Write down all the features that distinguish one lighthouse from another. Think of objects in your field that perform similar functions and make a list of their characteristics.

32.6. Use the data below to make a short story about the Round Island lighthouse.

Position	Round Island, the Isle of Scilly
Place	Sheer granite rock
Established	1887
Height Of Tower	19 Metres
Height Of Light Above Mean High Water	55 Metres
Automated	1987
Electrified	1966
Lamp	1 Kw Mbi
Optic	360MM Revolving Optic
Character	One White Flash Every 10 Seconds
Intensity	42,945 Candela
Range Of Light	18 nautical miles
Fog Signal Character	4 Blasts Every 60 Seconds
Fog Signal Range	2 nautical miles

GRAMMAR FOCUS

32.7. Note how the condition is formulated in the last sentence of the text: ... *if a ship ...* ***lost*** *sight of one lighthouse, it* ***would find*** *the glow of the next one.* **Here the condition is less probable or unlikely, but still we speak about future or present. In this case, the verb in the conditional clause is put into the Past tense, and the main clause uses *would* + Infinitive. Translate the following sentences into your native language. Try to answer the questions.**

1. What would happen if the moon revolved around the earth twice as fast? 2. If we had the technology to survive on Mercury, the planet closest to the sun, what would it be like to live there? 3. Which constellations would be visible if we could turn off the Sun? 4. What would happen if the Earth stopped spinning? 5. What would you hear if a meteor flew by? 6. If all the glaciers melted, how high would the oceans rise? 7. If you met an alien, what would you say? 8. If you had no telephone or computer, how would your life change? 9. If you could travel faster than light, where would you go? 10. If you had only one wish, what would it be and why?

FOLLOW UP

32.8. Think about things and technologies that are no more the same as they were before. Name at least 3 things that have changed. Explain how and why.

UNIT 33. WHAT IS THE FUTURE OF SUPERSONIC FLIGHT?

PRE-READING

Individually, write 5 objects that can fly. Arrange them according to their speed. Compose sentences, e.g.: *A swallow flies at a speed of about 15 m/s (meters per second)*. Ask your neighbour about their objects and the speeds they fly at.

ACTIVE VOCABULARY

wealthy	багатий	to prohibit	забороняти
supersonic	надзвуковий	viable	життєздатний
profitable	прибутковий	a propulsion system	рушійна система
a crash	аварія	to eliminate	усунути, ліквідувати
to wane	спадати, слабшати	to feature	містити
to bet	битися об заклад	altitude	висота
a sonic boom	звуковий удар	understatement	зменшення, применшення
onerous	обтяжливий, важкий	conventionally	традиційно

READING

33.1. Read the text and say whether the statements are TRUE of FALSE.

(1) In 2003, the Concorde, the jet that took the wealthiest of air travelers from New York to London in a mere three hours, flew its last voyage after nearly three

decades of commercial flights. The supersonic jet, which flew at **Mach** 2 (double the speed of sound) was never very profitable, and after the deadly crash of Air France Flight 4590 in 2000, enthusiasm for the aircraft waned.

(2) But several aircraft manufacturers are betting that enough customers miss crossing the Atlantic in half the time it takes today to make supersonic flight practical and profitable, and have a variety of new designs **in the works** to bring Mach speeds back to commercial flight.

Quieting the Boom

(3) One of the biggest challenges facing supersonic flight is the sonic boom. The noise made by an aircraft breaking the sound barrier was onerous enough that it was prohibited over the United States and other countries, severely limiting the number of viable commercial routes.

(4) The Aerion Corporation is designing a supersonic business jet, with new wing technology and propulsion systems. It would fly at Mach .99 over land as fast as possible while respecting regulations. Once over the ocean, it would speed up the Mach 1.5, completing the trip from New York to Paris in just over four hours.

(5) Aeronautics company Hypermach is taking things further by trying to eliminate or reduce the sonic boom, making supersonic flight over land a reality. Its SonicStar will feature "electromagnetic drag reduction technology" that will soften the boom, allowing it to fly at Mach 3.6 at an altitude of 60,000 feet.

Going Hypersonic

(6) Of course, there are those who point out that humans mastered supersonic flight more than 60 years ago, and that it's time **to take things up a notch**. At the forefront is EADS, the owner of the Airbus, and its ZEHST: Zero Emission High Speed Transport. "High speed" is something of an understatement; the ZEHST is set to fly at hypersonic speeds: four times the speed of sound, or more than 3,000 miles per hour.

(7) So what about the sonic boom? The ZEHST will fly above the atmosphere, so the boom would not reach the surface. It would even tackle the issue of pollution. Conventionally, supersonic aircraft burn more fuel than their subsonic counterparts, which makes sense. But the ZEHST is being designed to fly on biofuel made from seaweed. So it's a win-win-win: no boom, no pollution, and flights from Paris to Tokyo in two and a half hours.

(8) Of course, there's a catch: EADS predicts that the plane won't be available for commercial flights for at least 30 years.

NB: Mach – a unit for measuring speed, especially of an aircraft, in relation to the speed of sound. Mach 1 is the speed of sound, Mach 2 is twice the speed of sound etc.

1. By 2003 the Concorde had been making commercial flights for 4 decades. 2. This aircraft was travelling at a speed of more than 2,000 km per hour. 3. In 2000, there was a terrible accident with the Concorde. 4. Supersonic flights were prohibited in the United States because of numerous crashes. 5. The Aerion Corporation is designing an aircraft which will be able to cross the Atlantic in two hours. 6. A hypersonic airplane SonicStar has been already created. 7. The first supersonic flights were made at the beginning of the 20th century. 8. Contemporary supersonic planes use more fuel than subsonic ones. 9. The ZEHST aircraft is designed to fly on biofuel made from sunflowers.

33.2. Put these events into a chronological order. Make a short story using the words *first, then, after that, further, afterwards, finally, eventually* for sequencing the events. Example: *The launch of the project. – First, the project was launched two years ago.* For more practice see also Appendix 1.

1. The appearance of the first supersonic aircrafts. 2. Crash of Concorde's Air France Flight 4590. 3. Available commercial hypersonic flights. 4. The start of Concorde programme. 5. Concorde's last voyage. 6. Designing of ZEST technology.

SPEECH PATTERNS

33.3. Analyse the speech pattern and translate the sentences using the pattern.

in the works	в роботі, готується
There are some new laws in the works that will affect all of us.	Готуються декілька нових законів, які вплинуть на всіх нас.

A. 1. Мій дипломний проект ще не закінчений, але він в роботі. 2. Дослідження ще триває. 3. Письменник розповів про новий роман, над яким він працює. 4. Квантові комп'ютери, що зараз розробляються, зроблять революцію в обчисленнях. 5. Електричні автомобілі, над якими зараз працюють, допоможуть зберегти довкілля.

to take things up a notch	покращувати, інтенсифікувати
He gave me some advice on how to take my business up a notch.	Він дав мені кілька порад, як вивести мій бізнес на новий рівень.

B. 1. Ця книга допоможе вам вдосконалити свої навички малювання. 2. Шоколад завжди покращує настрій. 3. Використання графічних прискорювачів значно підвищує швидкість обчислень. 4. Якщо додати в цю страву трохи перцю, це покращить її смак. 5. Ці курси призначені для вдосконалення вашої англійської.

VOCABULARY

33.4. Match two parts to form a complex word from the text. Find it in the text and put down the number of the paragraph (1-8) to each word. Try to form other words with either parts, e.g. *sea*side, *sea*bed; re*statement*, over*statement* etc.

1	sea	a	statement
2	super	b	sphere
3	counter	c	craft
4	under	d	weed
5	electro	e	dict
6	air	f	sonic
7	fore	g	part
8	atmo	h	fuel
9	bio	i	magnetic
10	pre	j	front

PRACTICE

33.5. Fill in the gaps with the words in the box.

sub-sonically altitude speed aircrafts journeys curvature sonic boom bang

As Concorde travelled at more than twice the ___ of sound (mach 2.0 or about 1520 mph), it created a ___, which could sound like a loud ___, crack or deep rumble. This loud noise and the complaints that inevitably came with it resulted in Concorde being unable to fly certain routes, or having to fly ___ (at the speed of normal airliners) to complete certain ___. It is one of the main reasons why airlines backed out of purchasing Concordes or developing their own supersonic ___.

As well as flying faster than other airplanes, Concorde also flew higher, flying at an ___ of about 50,000 to 55,500 feet (although it could fly up to 60,000 feet). At this height, it was possible to see the ___ of the Earth as if you were on the edge of space. Air turbulence is also less of a problem at that height, meaning a less bumpy flight.

GRAMMAR FOCUS

33.6. Compare the use of Continuous Active and Continuous Passive in the text: *The Aerion Corporation is designing a supersonic business jet ...* **(Paragraph 4) and** *the ZEHST is being designed to fly on biofuel ...* **(Paragraph 7). Rewrite the following sentences into Passive.**

1. Stephen King's new film is breaking the box-office records. 2. A British company is launching a digital currency accessible without the Internet. 3. Sitting long hours at the desk is destroying our health. 4. New technologies are enhancing food production. 5. NASA is monitoring asteroids passing the Earth. 6. The world is producing gigantic amounts of waste. 7. Scientists are looking for signs of possible life on Mars. 8. Volunteers are currently taking care of the city parks and public gardens. 9. The company is thinking of the ways to reduce production costs. 10. Artificial intelligence's algorithms and technologies are changing our everyday lives.

FOLLOW UP

33.7. Learn about another supersonic passenger aircraft, compare its characteristics with those of Concorde and make a 1-2 minute report.

UNIT 34. FUSIONMAN AND HIS JET-POWERED WINGS

PRE-READING

Individually, think of 3 tools (devices) that enhance human's physical abilities. Describe their action mentioning the design, the way it is used and the purpose. For example: *Glasses consist of glass or hard plastic lenses mounted in a frame that holds them in front of a person's eyes, typically using a bridge over the nose and arms which rest over the ears. Glasses are designed for vision correction.* Share the information with your neighbour.

ACTIVE VOCABULARY

precocious	рано розвинений	hang gliding	дельтапланеризм
to escape	втекти	to adopt	прийняти
feathered	вкритий пір'ям	jet engine	реактивний двигун
to glue	приклеювати	foldable	розкладний
wax	віск	fiber	волокно
to plunge	пірнати	to kick in	(*розм.*) вмикати
catchy	привабливий	stuntman	каскадер
to log	реєструвати	to soar	планерувати
stint	межа, норма	to fare	бути, жити, поживати

READING

34.1. Read the text and answer the questions.

(A) When the Roman poet Ovid wrote his collection of mythical poems, "Metamorphoses," he included among it one of the most famous stories in history: The tale of Daedalus and his precocious son, Icarus, who escaped King Minos's prison using a pair of feathered wings, which were glued on with wax. Icarus though got too excited and proud of his flying and flew too close to the sun, his wings melted and he plunged into the sea.

(B) A Swiss citizen who calls himself FusionMan has become a modern-day Daedalus – not an Icarus – by becoming the world's **first person to fly** with fitted wings attached to his back, reaching speeds as high as 190 mph (306 kph) in the air. But how did he do it? He certainly didn't use wax, right?

(C) First off, FusionMan isn't really FusionMan's real name. Although the name is catchy and appropriate, his given name is actually Yves Rossy. Born in Switzerland on August 27, 1959, Rossy was a professional military pilot between the ages of 20 and 28 where he flew Hunter, Tiger F-5 and Mirage III planes and logged more than 1,000 hours on a **Mach** 2 fighter jet. After his stint in the military he worked as a copilot on DC-9 and Boeing 747 planes for Swissair.

(D) Rossy clearly loves to fly, and he's practiced aerobatics, hang gliding, paragliding and skydiving. So it isn't too surprising that after he left his job as a commercial pilot, he started work on a homemade pair of wings that would allow him to fly through the air horizontally at accelerated speeds.

(E) He soon adopted the name FusionMan, and with his sponsors, which include Swiss watch company Hublot and the German jet engine company Jet Cat, he spent more than $190,000 on developing his futuristic set of wings. The foldable wings are constructed from carbon fiber, which make the material simultaneously light and strong, and are fitted with four kerosene-fueled jet engines that provide the acceleration.

(F) FusionMan can't take off from the ground by himself; instead, he's flown up 7,500 feet (2,286 meters) in an airplane, where he simply steps out wearing the wings. After a short freefall, the wings unfold and the jet engines kick in, allowing him to reach speeds of up to 186 mph (299 kph). He doesn't just fly horizontally, though; simply by using his body he can also dive, perform figure-eights and execute 360-degree barrel rolls.

(G) The stuntman made his first successful flight over the Alps, soaring through the air for about five minutes, on May 15, 2008. Previous attempts hadn't fared so well. He nearly lost control of the wings during a jump in 2005 and couldn't access his parachute until he was only 1,500 feet (457 meters) above the ground, and damage to a previous set of wings in 2007 caused him to start over and build a newer prototype. FusionMan continues to look toward the future, however, and he plans to fly over the English Channel and the Grand Canyon.

1. Where did the Roman poet Ovid describe the story about Icarus? 2. What is the nick-name of a modern Icarus? 3. What country does he come from? 4. How fast can FusionMan fly? 5. What was his profession? 6. What are FusionMan's wings made from? 7. Are there any engines on his wings? 8. Can FusionMan take off from the ground? 9. Does he fly only horizontally? 10. Were all his flights successful?

34.2. Which of the paragraphs (A-G) contains the following information? Next to the statement (1-11), put down the letter (A-G). Letters can repeat.

1. Military planes that Eves Rossy flew. 2. The figures that Rossy can execute in the air. 3. The mountains that Rossy has flown over. 4. The substance Icarus used to glue on the wings. 5. The material Rossy's wings are made of. 6. Rossy's birthday. 7. Rossy's citizenship. 8. The number of jet engines attached to Rossy's wings. 9. The altitude the FusionMan jumps from. 10. Air sport hobbies Rossy went in for. 11. Rossy's last job.

34.3. Put down all proper names from the text classifying them into groups:
1) person; 2) country; 3) company; 4) geographical object; 5) device.

SPEECH PATTERNS

34.4. Analyse the speech pattern and translate the sentences using the pattern.

the first person to fly	перший, хто полетів; він полетів першим
He was the first to answer this question.	Він відповів на це запитання першим.

1. Британці були першими, хто підкорив найвищу гору Еверест у 1921 році. 2. Нейл Армстронг був першою людиною, що ступила на поверхню Місяця. 3. Вважається, що капітан завжди залишає свій корабель останнім. 4. Хто наступним спробує влучити в ціль? 5. Джон був останнім, хто привітав мене з днем народження.

VOCABULARY

34.5. Fill in the gaps in the words from the text and translate them into your native language.

_scape	Swit_ _ _land	_ _celerate	simult_ _ _ _usly
p_unge	mi_ _tary	incl_de	exe_ute
att_ch	f_ _hter jet	eng_ _e	_ _untman
certa_ _ly	para_ _iding	_ _velop	succe_ _ful
a_ _ropriate	ho_ _made	fold_ _le	attem_ _

PRACTICE

34.6. Odd one out and explain why:
fly, glide, take off, unfold, soar;
plunge, float, dive, swim, continue;
stuntman, citizen, poet, pilot;
wax, glue, wing, carbon, kerosene;
the Alps, the English Channel, Switzerland, the Grand Canyon;
Swiss, German, Roman, English, Grand;
over, toward, through, during, up, down;
to develop, to damage, to construct, to make, to produce, to manufacture;
to write, to fly, to get, to spend, to melt, to hang, to leave;

July, August, November, December;
year, century, age, minute, month, second;
famous, however, professional, successful, military.

GRAMMAR FOCUS

34.7. Insert prepositions where necessary:

to look ___ the future; to fly ___ accelerated speeds; to attach smth. ___ his back; to be proud ___ flying; to plunge ___ the sea; to escape ___ the prison; to take off ___ the ground; to fly ___ the air; to fly ___ the plane; to construct smth. ___ fiber; to fly ___ the English Channel; to lose control ___ the wings; 1500 feet ___ the ground; to access ___ the parachute.

FOLLOW UP

34.8. Learn more about the FusionMan's achievements and make a short report.

UNIT 35. A MINI SUB THAT COULD STEER THROUGH THE BODY

PRE-READING

In pairs, choose one of the medical instruments or devices and explain its structure and the principle of its operation. For example: *A **syringe** is a reciprocating pump consisting of a piston that fits tightly within a cylindrical tube. The piston is pulled and pushed along the inside of the tube, allowing the syringe to take in and expel liquid or gas through a discharge orifice at the front end of the tube. The open end of the syringe may be fitted with a needle. Syringes are used in medicine to make injections, apply compounds such as glue or lubricant, or measure liquids.*

ACTIVE VOCABULARY

a vehicle	транспортний засіб	net force	рівнодіюча сила
to power	живити	relatively	відносно
propulsion	рушійна сила	saline	фізіологічний розчин
circuitry [ˈsəːkitri]	схема	gastrointestinal tract	шлунково-кишковій тракт
surrounding	оточуючий		

READING

35.1. Read the text and choose the correct answer.

In the future, tiny vehicles might travel through your body to image your insides, take samples, and deliver drugs. At Stanford University, engineers built a prototype of such a device. It's about the size of Abraham Lincoln's head on a penny. They power and control the prototype wirelessly by sending radio waves to its two-by-two-millimeter antenna from about two inches away. No battery is required, which is the key to miniaturization.

Mechanical propulsion is inefficient at this scale. Instead, the designers use magnetohydrodynamic propulsion, which takes advantage of the fact that an external magnetic field can push an object by creating a Lorentz force on its electrical circuitry. They operate the device near a magnet – imagining a patient lying on a magnetic table – and use radio waves to tell the prototype how to use its electrodes. The electrodes send electrical current through the surrounding fluid, creating a net force that moves the device. With an upward magnetic field, a counterclockwise electrical current pushes the device forward and a clockwise current pushes it backward. By making circuits that create opposing forces on each side, the device can be also turned left or right.

With a relatively weak magnet, the prototype moves 0.2 inches per second in a dish of saline. If it were in the blood stream – cleaning out patient's arteries, for example – you'd need a stronger magnet to overcome the flow of blood. But that **is still a ways off**. In the near term, the inventors imagine using the device to image the gastrointestinal tract; there, it wouldn't need to travel as fast. It could reduce the cost of cancer screenings, and it would be a welcome alternative to at least one traditional method: colonoscopy.

1. Engineers at Stanford University have designed ___.
a) an antenna b) an electric cirsuit c) a device to travel inside human body
2. What is its size?
a) two by two millimetres b) two inches c) smaller than a penny
3. What is it used for?
a) to make blood tests b) to deliver drugs c) to create opposing forces
4. What is the driving force for the device?
a) magnetohydrodynamic propulsion b) mechanical propulsion c) gravitation
5. What is the speed of the vehicle in saline solution?

a) less than an inch per second b) the same as the blood flow c) it doesn't move

6. Why is the device still ineffective for cleaning blood vessels?

a) it travels too slow b) it travels too fast c) it costs too much

SPEECH PATTERNS

35.2. Analyse the speech pattern and translate the sentences using the pattern.

to be / to go a (long) way(s) off	ще далеко (*про час та відстань*)
The rescue party was moving in his direction, but they were still a ways off.	Рятівна команда рухалась до нього, але вони були ще дуже далеко.

1. До іспитів було ще далеко. 2. На далекій відстані у полі ми побачили вогонь. 3. Професор Хокінг вважав, що до створення штучного інтелекту – повної цифрової копії людського – ще дуже далеко. 4. Оскільки існує дуже багато обмежень, доставка вантажів дронами з'явиться не завтра. 5. Деякі експерти вважають, що до повністю безготівкової економіки ще далеко.

VOCABULARY

35.3. Select from the text words and expressions that match the following categories.

Devices	**Tools**	**Substances**	**Physical phenomena**	**People**

35.4. Give synonyms to the words of the list (a) and antonyms to the words of the list (b):

a) tiny; to image; a device; to require; propulsion; advantage; to use; forward; to travel; to reduce; traditional;

b) future; inside; advantage; external; to push; near; to send; weak; saline (water); fast; to reduce; traditional.

35.5. Find in the text words and expressions that correspond to the following movements and directions. Add nouns or verbs to make collocations, e.g.: *turn / move / go / look left*. Compose sentences of your own.

1) → 2) ↑ 3) ↓ 4) ← 5) →← 6)  7)  8)

GRAMMAR FOCUS

35.6. Note different functions of the word "*to*" in the text. Determine the functions of *to* in the following extracts and translate them into your native language. Compose sentences of your own using *to* in all the functions.

sending radio waves **to** its two-by-two-millimeter antenna; the key **to** miniaturization; use radio waves **to** tell the prototype; tell the prototype how **to** use its electrodes; you'd need a stronger magnet **to** overcome the flow; using the device **to** image the gastrointestinal tract; it wouldn't need **to** travel as fast; alternative **to** at least one traditional method.

FOLLOW UP

35.7. Learn more about other miniature devices that serve medical purposes and make a short report.

UNIT 36. MICROBES ARE SMARTER THAN YOU THOUGHT

PRE-READING

Give your own definitions of the words *Smart* and *Intelligent*. What, in your opinion, is the difference? Give examples of smart and intelligent people, behaviour, machines etc. Consult the dictionary for exact meanings of the words.

ACTIVE VOCABULARY

vast majority	переважна більшість	conscious	свідомий
a species (*pl* species)	вид	to process	обробляти
to languish in obscurity	животіти у безвісності	dedicated	самовідданий
to exhibit	демонструвати	essentially	по суті
to hibernate	впадати в сплячку	to starve	голодувати
to thrive	розростатися	completely	повністю
protists	найпростіші		

READING

36.1. Read the text and say whether the following statements are TRUE, FALSE or NOT GIVEN.

The vast majority of species on Earth are single-celled. Most of these languish in obscurity – many have never even been named – but some of the relatively few species that have been studied exhibit remarkable abilities.

Many of these are physical: some micro-organisms are amazingly strong; others can hibernate for hundreds of thousands of years or thrive in environments so extreme that they would kill off most other life forms in a flash.

But many bacteria and protists also exhibit behaviour that looks remarkably intelligent. This behaviour isn't the result of conscious thought – the sort you find in humans and other complex animals – because single-celled organisms don't have nervous systems, **let alone** brains.

A better explanation is that they're "biological computers" with internal machinery that can process information. **The way they communicate** is one of the many examples.

Bacteria talk to each other with chemicals. They do so for a host of reasons, some of them are hard to understand unless you are another bacterium (or a dedicated bacteriologist), but one of the most straightforward is demonstrated by Bacillus subtilis.

If B. subtilis individuals are growing in a food-poor area, they release chemicals into their surroundings. These essentially tell their neighbours: "There's not much food here, so clear off or we'll both starve." In response to these chemical messages, the other bacteria set themselves up further away, completely changing the shape of the colony.

1. Most species on Earth have very complex organisation. 2. All living creatures on Earth have names. 3. Many creatures can remain in dormant condition for thousands of years. 4. Bacteria are multi-celled organisms. 5. All complex animals have the ability of conscious thought. 6. Bacteria can exchange information with each species. 7. Bacteria use chemicals to kill each other. 8. People can easily understand bacteria's language. 9. All dedicated bacteriologist study the behaviour of Bacillus subtilis. 10. When there is nothing or little to eat, Bacillus subtilis release some chemicals and other bacteria move to this place.

SPEECH PATTERNS

36.2. Analyse the speech patterns and translate the sentences using the pattern.

let alone (+ Noun / + Verb)	не кажучи вже про...; не те що ...
He didn't invite his brother, let alone his friends.	Він не запросив навіть свого брата, не кажучи вже про друзів.
The baby can hardly say "Daddy", let alone talk.	Дитина навряд чи може сказати «тато», не те що говорити.

A. 1. Він не вміє навіть на велосипеді їздити, не кажучи вже керувати автомобілем. 2. В них немає грошей навіть на їжу, не те що на дорогі меблі. 3. Ця кватира давно не бачила прибирання, не кажучи вже про ремонт. 4. Це таке складне питання, що його й за рік не вирішити, не те що за півгодинне обговорення. 5. Такі здібності є дивовижними для будь-якої людини, не кажучи вже про дитину. 6. Ілюзорним здається навіть виявлення позаземного сигналу, не кажучи вже про зустріч з іншопланетянами.

the way they communicate	те, як вони спілкуються (спосіб комунікації)
Scientists built a simple computer model of **the way animals interact** with each other when they're in groups.	Вчені побудували просту комп'ютерну модель того, як тварини спілкуються один з одним, коли вони у групах.

B. 1. Новий супутник вдосконалить спосіб, яким ми прогнозуємо погоду на Землі. 2. Розуміння того, як ростуть міста, є дуже важливим. 3. Проведено ретельні дослідження компонентів і того, як вони взаємодіють. 4. Цифрові технології змінюють те, як працюють інженери. 5. Молоді вчені запропонували програмне забезпечення, яке може змінити те, як зазвичай функціонують початкові та середні школи, забезпечивши безперебійний потік інформації між учнями, вчителями та батьками. 6. Як ми бачимо світ навколо нас залежить від того, як наше око заломлює світло.

VOCABULARY

36.3. Choose antonyms to the following words from the text:

majority	maturity; minority; integrity; eternity; obscurity; obesity
few	much, too, rather, many, so
to exhibit	to extinguish; to inhibit; to hide; to ride; to slide
remarkable	ordinary; striking; rare; noteworthy; outstanding
strong	week; weed; walk; wheel; weak; wake; wink; weight
intelligent	clever; kind; sympathetic; ignorant; soft; careful
internal	intermittent; international; extreme; extended; external
hard	bad; sad; dull; full; odd; even; easy; early; every
poor	sour; rich; expensive; cool; tiny; enormous

36.4. Note the <u>underlined</u> words in the text. They signal cause-effect relations between ideas. Put the following ideas into two categories: a) cause; b) effect. For more practice in cause and effect phrases see Appendix 1.

1. Conscious thought. 2. Single-celled organisms don't have nervous systems. 3. Bacteria talk to each other with chemicals. 4. You are a dedicated biologist. 5. Bacteria will starve. 6. B. subtilis individuals are growing in a food-poor area.

36.5. Paraphrase the sentences. The structure of the sentences may be changed.

1. Most of single-celled creatures languish in obscurity. 2. Some of the studied species exhibit remarkable abilities. 3. Some micro-organisms can thrive in really extreme environments. 4. Other life forms may be killed off in such conditions in a flash. 5. Some bacteria exhibit remarkably intelligent behaviour. 6. Bacteria communicate with each other for a host of reasons. 7. He is a dedicated bacteriologist. 8. Clear off or we'll both starve. 9. Other bacteria set themselves up further away.

GRAMMAR FOCUS

36.6. Following are the adjectives from the text. Determine their degree – Positive, Comparative or Superlative. Supply other forms if possible.

vast; single-celled; most; many; remarkable; physical; strong; extreme; intelligent; conscious; complex; nervous; better; biological; internal; hard; dedicated; most straightforward; poor; chemical; further.

36.7. Note the structure of the sentence from the text: ... *some of them are hard to understand*. **Pay attention to the passive meaning of the idea and the active form of the infinitive (mostly with adjectives** *difficult, easy, impossible, possible***). Translate into English using the same sentence structure: Subject + linking verb (*is / appears / can be*) + Adjective + *to*-Infinitive.**

1. Висококваліфікованого перекладача важко знайти. 2. Цю задачу легко вирішити за допомогою методу невизначених коефіцієнтів. 3. Точну дату виверження вулкана неможливо передбачити. 4. Його легко помітити серед натовпу: його зріст майже 2 метри. 5. Іноді жіночу логіку неможливо зрозуміти, особливо чоловікам. 6. Цю красу важко описати словами. 7. Уникнути помилок при програмуванні практично неможливо. 8. Великі кратери на Місяці легко побачити неозброєним оком. 9. Іноземну мову легше вивчати, знаходячись у мовному середовищі. 10. Точні розміри об'єкта важко визначити без спеціальних приладів.

FOLLOW UP

36.8. Read the definitions of two words from the text: *Smart* refers to the ability to apply previously acquired knowledge in practical situations. ***Intelligent*** refers to the ability to acquire knowledge. (from http://pediaa.com/difference-between-smart-and-intelligent/). Write a short essay supporting these definitions.

SECTION 2. SPEAK ACCURATELY

1. ІМЕННИКИ (NOUNS)

Множина іменників (Plural of nouns)

Утворення множини іменника

Закінчення *-s*	**Закінчення *-es***	**Інша форма**
a car – cars an engine – engines a tree – trees	a watch – watches a dress – dresses a dish – dishes a box – boxes	a man – men a woman – women a child – children an ox – oxen a tooth – teeth a goose – geese a foot – feet a mouse – mice a penny – pence
a way – ways	a city – cities	
a piano – pianos a photo – photos a ratio – ratios	a potato – potatoes a tomato – tomatoes a tornado – tornadoes	
a roof – roofs a cliff – cliffs a gulf – gulfs a safe – safes a chief – chiefs	a leaf – leaves a life – lives a knife - knives	

Запам’ятайте іменники латинського походження.

Однина	**Множина**
an axis	axes
a datum	data
a formula	formulae
a phenomenon	phenomena
a nucleus	nuclei
an index	indices

Запам’ятайте!

Однина	**Множина**
a sheep	sheep
a series	series
a species	species

Однина	Множина
-	scissors
-	trousers
-	clothes
milk	-
money	-
silence	-
information	-

Використання в реченні

Singular subject	+	Vs (present)
		is / was
		... he / she / it

Plural subject	+	V (present)
		are / were
		... they

Комбінації з артиклями, займенниками та числівниками

a / an	+	Singular noun
the		
one		
some (uncountable)		
every / each / the whole / all		

-	+	Plural noun
the		
two, three … / many		
some (countable)		
all		

1.1. Put the nouns into Plural. Mind that the Indefinite Article (a /an) is not used in Plural.

I. A car, a mountain, a bed, a show, a king, the waiter, the teacher, a match, a man, the man, a woman, the woman, an eye, a wolf, a fox, the city, a boy, a family, a goose,

the watch, a mouse, a dress, a country, a play, the sheep, a tooth, a child, the ox, a deer, the life, a potato, the piano.

II. A minimum, an antenna, an index, a criterion, a cactus, a basis, a solarium, an alga, a matrix, an analysis, a quantum, a stimulus, a lacuna, a medium, an octopus, a curriculum, a prognosis, a meniscus, an appendix, a radius, a gymnasium.

1.2. Put down the words in Plural.

1.	a table		24.	a quantum	
2.	a maximum		25.	a waiter	
3.	a fox		26.	a vortex	
4.	an axis		27.	a man	
5.	a lady		28.	a shelf	
6.	a knife		29.	an eye	
7.	a chair		30.	a woman	
8.	a bus		31.	a box	
9.	a volcano		32.	an index	
10.	a match		33.	a boy	
11.	a way		34.	a goose	
12.	a millennium		35.	a cactus	
13.	a family		36.	a mouse	
14.	a foot		37.	a curriculum	
15.	a formula		38.	a photo	
16.	a wolf		39.	a sheep	
17.	a country		40.	a tooth	
18.	a thesis		41.	a child	
19.	a cactus		42.	a life	
20.	a piano		43.	a deer	
21.	an alumna		44.	an ox	
22.	a tree		45.	a tomato	
23.	a roof		46.	a focus	

1.3. Write down the sentences in Plural. Note: *this is – these are; that is – those are; it is – they are.*

1. This is a car. 2. This is a knife. 3. This is an old story. 4. That is a plate. 5. That is a new bookshelf. 6. That is a wooden staircase. 7. Is this a piano? 8. Is this a toolbox? 9. Is this a postman? 10. Is that a keyboard? 11. Is this a cordless mouse? 12. Is that a jet plane? 13. Is the window open? 14. Is the file on the desktop? 15. Is the service available? 16. That is not an index. 17. That is not a nebula. 18. This is not a full spectrum. 19. It is a heavy nucleus. 20. That isn't a clear hypothesis. 21. This isn't a solid medium. 22. It is a strong stimulus. 23. This is an electric charge. 24. This is a short circuit. 25. It is not a dangerous virus. 26. It isn't a bad mistake. 27. It isn't a homogeneous mixture. 28. It is not an electric vehicle.

1.4. Choose one of the options.

1. Our *knowledge / knowledges* of the past *is / are* insufficient. 2. The alumnae *was / were* happy to return back to *her / their* alma mater. 3. The financial crisis *affect / affects* people's lives. 4. As millennia *have / has* passed, we have understood much about the world around us. 5. The atomic nucleus *consist / consists* of protons and neutrons. 6. *- / A* golden alga *is / are* a planktonic or microscopic floating *plant / plants*. 7. The Ultimate electric sports car is only 4 *foot / feet* long. 8. *This / These* money *is / are* not enough to pay the bill. 9. Unfortunately, your spectacles *is / are* broken. 10. When the horizontal and vertical *axis / axes* meet, they form four quadrants.

1.5. Find and correct mistakes in the text.

Snowflakes facts

- The smallest snowflakes is called Diamond Dust crystals, and they might be as small as the diameter of a human hairs. The faceted crystals sparkle in sunlight as it float through the airs, which is how they got their name. They are somewhat rare, appearing in bitter cold weathers.
- About a million billion snowflakes fall each seconds, averaged over a typical years. That's enough snow to make one snowmen for every persons on earth every ten minute.
- Recent estimates suggest that about half of the world's population has never seen snow close up. Most of China experiences some snowfall, but most of India and

Indonesia does not. The equatorial regions of South America, Africa, as well as the desert regions of the Middles Easts, see the least snows on earth.

- About 98 percents of the Earth's water are in the oceans, leaving 2 percent as fresh water. About 90 percent of that fresh water are permanently frozen, mostly locked up in the Antarctic and Greenland ice sheets.

Присвійний відмінок іменників (Possessive case of nouns)

Іменник у присвійному відмінку відповідає на питання ***чий (whose)?***

- **Живі істоти**

Однина	**Множина**
The man's bag	The men's bags
The boy's bicycle	The boys' bicycles

- **А також:**

a month's holiday
today's party
the country's best opera house
a mile's distance

В сучасній англійській мові присвійний відмінок вживається також з назвами **неживих** предметів, наприклад: *the material's properties, the liquid's density* etc.

1.6. Rewrite the sentences using the possessive case of the nouns.

1. The office of our dean. 2. The questions of my teacher. 3. Headlines of the newspaper.4. The report of the professor. 5. The answer of the student. 6. The visit of the president. 7. The new textbook of our colleague. 8. The letter of her friend. 9. The cabin of the driver. 10. The tools of a designer. 11. The papers of these men. 12. The investigations of these scientists. 13. The achievements of the country. 14. The name of the inventor. 15. The meeting of the alumni. 16. The degree of Bachelor. 17. The issue of this week. 18. The scientific centre of the university. 19. News of today.

1.7. Put the word combinations into plural:

the cat's eye; an alumna's diary; the city's best restaurant; the wolf's footprint; an octopus's arm; the antenna's coaxial cable; a cactus's spine; a tooth's edge; the mouse's tail; the maximum's value; the alga's habitat; the alumnus's speech.

Артиклі (Articles)

Артикль	Вживання	Приклади
Неозначений ***a (an)***	Предмет є одним з класу споріднених предметів.	He is *a* student. This is *an* input device.
	Вперше йде мова про предмет.	Yesterday I saw *an* elephant.
	В значенні числівника *one.*	She has *a* hundred English books.
Означений ***the***	Йде мова про вже відомий предмет.	I bought *a* book yesterday. *The* book is interesting.
	Є пояснення до предмета, що робить його унікальним.	I gave him *the* book I bought yesterday.
	Коли ясно з контексту, який предмет мається на увазі.	Open *the* window, please.
	Перед географічними назвами (деяких країн, океанів, морів, річок, гірських масивів).	*the* USA, *the* Pacific Ocean, *the* Carpathians
	Коли перед іменником стоїть порядковий числівник	*the first* lesson*, the forth* year
	Коли перед іменником стоїть прикметник у найвищому ступені порівняння	*the highest* mountain*, the most talented* students
Відсутній	Перед власними іменами.	Kharkiv, England, Smith
	Перед речовинними іменниками, коли мається на увазі вся речовина. Коли йдеться про певну кількість речовини, вживається займенник *some*.	Ice is frozen water. He put *some* ice into the glass.
	Перед назвами днів, місяців, пори року.	on Friday, in October, in winter
	Якщо перед іменниками стоїть займенник, кількісний числівник чи питальне слово.	this student, some books, five pens, how many classes, what subject

1.8. Fill in the gaps with an article where necessary.

1. He is ___ engineer. 2. ___ computer is on ___ table. 3. Here is ___ magazine you want to read. 4. ___ Kharkov is ___ first capital of ___ Ukraine. 5. This is ___ new device. 6. All ___ students of our university were at ___ meeting. 7. I don't know this ___ rule. 8. ___ article is interesting. 9. Please, give me ___ piece of paper. 10. We will go to ___ theatre tonight.

1.9. Insert articles *a, an, the* or pronoun *some* where necessary.

1. ___ virus is ___ small program written by ___ hacker. 2. I am making ___ report on ___ Friday. ___ report is about ___ electric vehicles. ___ my scientific advisor said that ___ title of ___ report is too long. 3. Can you help me? I cannot find ___ root of ___ equation. 4. ___ iron ore always contains ___ impurities. 5. If you add ___ lemon juice into ___ cup of ___ tea, ___ colour of ___ tea will become paler. 6. ___ Coulomb's law states that ___ like charges repel and ___ opposite charges attract with ___ force proportional to ___ product of ___ charges and inversely proportional to ___ square of ___ distance between them. 7. If you squeeze ___ sesame seed or ___ sunflower seed between ___ two sheets of ___ paper, you can see ___ oil. 8. Making ___ chocolate is ___ complicated process, and it varies depending on how ___ chocolate will be used. 9. About 70 percent of ___ planet is covered with ___ water, and ___ average depth of ___ ocean is about 1,000 meters. 10. ___ fire is certainly one of ___ most important forces in ___ human history. 11. ___ easiest way to create ___ motion from ___ gasoline is to burn ___ gasoline inside ___ engine. 12. ___ telephone is one of ___ simplest devices you have in ___ your house.

1.10. Fill in the gaps. Symbol "-" means that nothing should be inserted.

1. Everyone knows Steve Jobs, ___ founder of ___ Apple Inc.

a) a, the b) the, - c) an, a d) -, the

2. ___ famous English naturalist Charles Darwin proposed ___ theory ___ evolution of ___ animal species.

a) a, a, the, the b) the, the, -, - c) an, -, the, - d) the, -, -, a

3. ___ length of ___ Thames is 346 km.

a) a, - b) the, the c) an, a d) -, -

4. ___highest mountain in ___ world is ___ Mount Everest in ___ Himalaya.

a) the, a, the, a b) a, a, a, a c) the, the, -, the d) the, the, the, the

5. ___ molecule is ___ electrically neutral group of ___ two or more atoms held together by ___ covalent chemical bonds.
a) a, the, the, a b) the, the, the, - c) an, a, the, the d) a, an, -, -
6. ___ electric cars have ___ several benefits over ___ conventional internal combustion engine automobiles.
a) an, a, a b) the, the, the c) -, -, - d) the, -, the
7. He studied at ___ National Technical University "KhPI".
a) a b) the c) an d) -
8. ___ single snowflake is typically ___ single crystal, while ___ ice cube is ___ polycrystal.
a) a, a, an, a b) the, a, the, a c) the, the, the, the d) -, -, -, -
9. Though he is ___ youngest scientist in ___ institute, his name is well known.
a) a, an b) the, the c) the, - d) -, the
10. My cousin is ___ teacher of ___ physics.
a) a, - b) the, the c) an, - d) -, a
11. ___ direction of ___ AC current changes between 50 and 60 times per second, depending on ___ electrical system of ___ country.
a) -, the, -, - b) the, -, the, the c) a, a, the, the d) -, -, -, -
12. ___ first construction cranes were invented by ___ Ancient Greeks and were powered by ___ men or ___ animals.
a) a, the, the, the b) the, the, -, - c) a, -, the, the d) the, the, the, the
13. ___ problem we discussed at ___ previous lecture may be considered from ___ different point of view.
a) a, the, a b) the, the, the c) the, the, a d) -, the, -
14. Who is ___ author of ___ book?
a) a, the b) the, the c) an, a d) -, -
15. ___ quarter of ___ hour was left before ___ beginning of ___ concert.
a) a, a, the, the b) the, the, the, the c) a, an, the, the d) -, an, the, the
16. We entered ___ hall and saw ___ group of ___ students of our university.
a) a, a, - b) the, a, - c) an, a, - d) -, a, a
17. ___ list of ___ distinguished scholars at ___ University of Oxford includes more than ___ forty Nobel laureates.
a) a, -, -, - b) the, the, the, the c) a, a, a, a d) the, -, the, -
18. ___ Large Hadron Collider first started up on ___10th of ___ September 2008, and consists of ___ 27-kilometre ring of ___ superconducting magnets.

a) - , -, the, the, the b) the, the, -, a, - c) a, the, the, the, a d) - , the, - , the, -

19. Two weeks are left before ___ end of ___ second semester, ___ exams are coming.

a) a, -, - b) the, the, the c) an, the, the d) -, the, a

20. On ___ first of ___ June we will take ___ examination in ___ Maths.

a) a, the, -, the b) the, -, the, - c) an, -, -, - d) -, the, the, a

Ланцюжки іменників (Noun phrases)

Іменники, що стоять перед головним іменником (останнім у ланцюжку), виконують функцію **означення**. Переклад здійснюється двома способами: 1) попередні іменники перекладаються як прикметники, наприклад: *steel beam – сталевий брус*; *world music festival – міжнародний музичний фестиваль*; 2) першим перекладається головне слово: *wheel suspension – підвіска коліс; reaction rate constant – постійна швидкості реакції.*

1.11. Translate the word combinations:

apple juice – apple prices; book shelf – book review, room temperature – room height, computer virus – computer efficiency, water transport – water analysis.

1.12. Translate into English:

паперовий пакет, сталеплавильний завод, кислотний дощ, вуличний рух, водяний насос; генератор пару, пучок електронів, екран комп'ютера, зменшення цін на нафту, корпус ракетного двигуна, система безпеки автомобіля, температура утворення льоду, система управління базами даних.

1.13. Change the highlighted prepositional phrases as follows: *collection of flowers – flower collection*.

1. 2018 was the fourth-warmest year on record, and trends of the change of climate suggest that temperatures will only continue to climb**.** 2. Researchers are teaching AI to understand the meanings of words beyond their strict definitions from dictionary. 3. A photo-acoustic effect is a phenomenon in which pulses of light are converted into sound when absorbed by a material. 4. Zirconium has very high resistance to heat. 5. Since 1979, the rate of loss of ice in Antarctica has actually increased six-fold – from roughly 40 billion tons per year in the 1980s, to around 250 billion tons per year now.

2. ЗАЙМЕННИКИ (PRONOUNS)

Особові, присвійні, зворотні та підсилюючі займенники

Особові		**Присвійні**		**Зворотні та підсилювальні** (-ся, себе, сам)
Називний відмінок (хто?)	Об'єктний відмінок (кого? кому?)	I форма (чий? чия?)	II форма (абсолютна)	
I (я)	me (мене, мені)	my (мій)	mine (мій)	myself
You (ти)	you (тебе, тобі)	your (твій)	yours (твій)	yourself
He (він)	him (його, йому)	his (його)	his (його)	himself
She (вона)	her (її, їй)	her (її)	hers (її)	herself
It (воно)	it (його, йому)	its (його)	its (його)	itself
We (ми)	us (нас, нам)	our (наш)	ours (наш)	ourselves
You (ви)	you (вас, вам)	your (ваш)	yours (ваш)	yourselves
They (вони)	them (їх, їм)	their (їхній)	theirs (їхній)	themselves

Приклади

I work in an office. **My** office is in the centre of the city. This office is **mine**. Call **me** to **my** office. **I** will come to **your** office **myself**.

Зворотні займенники також вживаються як **підсилювальні слова** і відповідають українському *сам*. У цьому значенні зворотний займенник стоїть у кінці речення або безпосередньо після підсилювального слова.

I have seen it **myself.** – Я бачив це сам. I **myself** did not want to sleep. – Я і сам не хотів спати.

Вказівні займенники

Однина	**Переклад**	**Множина**	**Переклад**
this	це, цей	**these**	ці
This man	Цей чоловік	these men	Ці чоловіки
This is a key	Це – ключ	These are keys	Це – ключі
that	то, той	**those**	ті
That man	Той чоловік	Those men	Ті чоловіки
That is a key	То – ключ	Those are keys	То – ключі

Кількісні займенники

Займенники ***many, few*** вживаються перед **злічуваними** іменниками у множині, а також замінюють їх, наприклад: ***There were <u>many</u> students in the room. She has <u>few</u> books.***

Займенники ***much, little*** вживаються перед **незлічуваними** іменниками, і не замінюють їх, наприклад: ***There is <u>much</u> snow on the ground. I have very <u>little</u> time.***

	Злічувані іменники		**Незлічувані іменники**	
багато	many lots of a lot of plenty of	computers days clouds countries people	much lots of a lot of plenty of	snow time air fruit fish
мало	few		little	
небагато	a few		a little	

Plenty of має додатковий відтінок значення – *більш ніж достатньо*, в той час як *many, much, lots of* та *a lot of* означають велику кількість. *Lots of* та *a lot of* здебільшого використовуються у менш формальних ситуаціях.

Неозначені займенники

Займенники ***some*** та ***any*** використовуються для позначення **невизначеної кількості**: *some letters, some people, some sand*.

Some використовується в стверджувальних реченнях, а ***any*** – в питальних та негативних: *There are <u>some</u> cars in from of the house. Have you received <u>any</u> letters from her? They didn't put <u>any</u> questions.*

Any використовується, як правило, в **загальних** питаннях (*так / ні*), а в **спеціальних** питаннях і питаннях–проханнях чи пропозиціях використовується ***some***: *Do you have <u>any</u> ideas where to go tonight?* (загальне питання); *Where can I get <u>some</u> information on the exhibition?* (спеціальне питання до обставини місця); *Would you add <u>some</u> salt to the salad?* (питання-прохання) *Do you want <u>some</u> more coffee?* (питання–пропозиція).

У стверджувальних реченнях ***any*** означає *будь-який*: *<u>Any</u> help will be welcome.*

No означає *ніякий, ніякі*: *I have <u>no</u> ticket. <u>No</u> comments.*

Похідні займенники від ***some***, ***any***, ***no*** мають аналогічні значення

Займенник	Значення	Коментар
something	щось	
somebody = someone	хтось	
somewhere	десь	
anything	щось	*у питальних та негативних реченнях*
	що-завгодно	*в стверджувальних реченнях*
anybody = anyone	хтось	*у питальних та негативних реченнях*
	хто-завгодно	*в стверджувальних реченнях*
anywhere	десь	*у питальних та негативних реченнях*
	де-завгодно	*в стверджувальних реченнях*
nothing	ніщо, нічого	
nobody = no one	ніхто	
nowhere	ніде	

2.1. Fill in the gaps with personal Pronouns in the proper form.

1. On my way home I met Peter and told ___ about the trip. 2. I need this book badly. I can't prepare my report without ___. 3. I don't know the way to the railway station. Couldn't you show it to___? 4. We are going to spend the summer in the country. Will you join ___? 5. Wait for us at the bus stop. ___ will be back in no time. 6. If you give me your E-mail address, ___ will write to ___. 7. I know this woman. ___ works at the library with my mother. 8. If I see Helen, I'll ask ___ to ring ___ up tomorrow. 9. These photos are so nice. Where did you take ___? 10. You are to be here at 7 o'clock. We'll be waiting for ___.

2.2. Choose one of the options.

1. *This / These* is a new appliance. 2. *That / Those* were bad mistakes. 3. *That / Those* is a diesel engine. 4. *This / These* is an electric circuit. 5. *Is / Are this / these* matrices? 6. Is *that / these* a power plant? 7. Is *this / those* a nitric acid? 8. *Is / are that / those* a laptop? 9. *This / These is / are* computer viruses. 10. *This / Those* is a thumb law. 11. *This / These* processor *is / are* not available yet. 12. *This / These* planets *is / are* seen with a naked eye.

2.3. Fill in the gaps with *few, little, a few, a little.*

1. I couldn't buy the car because I had ___ money left. 2. Let us buy some ice-cream, I have ___ money left. 3. ___ pupils speak English as fluently as she does. 4. There were very ___ people in the streets. 5. We can't stay longer because we have too ___ time before the train. 6. Give me ___ apples. 7. They spent ___ days in the country and then returned to Kharkiv. 8. Ask Ann to help you to translate the letter; she knows French ___. 9. Mary works hard at her English. She makes ___ mistakes in her speech. 10. Can you lend me ___ money?

2.4. Choose one of the options.

1. I know *her / hers* handwriting, this note is not *her / hers*. 2. *Our / Ours* train is late but *their / theirs* is already coming. 3. There are more pages in Peter's paper than in *my / mine*. 4. The neighbouring house has been already renovated. *Our / Ours* is not ready yet. 5. When you see Sam, ask *he / him / his / himself* to call me. *He / Him / His / Himself* promised to help *I / me / my / mine / myself*. 6. Legions of robots now carry out *we / us / our / ours* instructions unreflectively. How do *we / us / our / ours / ourselves* ensure that these creatures always work in *we / us / our / ours* best interests? Should we teach *they / them / their / theirs / themselves* to think for *they / them / their / theirs / themselves*? And if so, how are we to teach *they / them / their / theirs / themselves* right from wrong? 7. In 1746 a French clockmaker, Monsieur Passemont (*he / him / his / himself* first name is not known), completed a clock which is almost certainly the first in the world to be able to take account of a new millennium. *It / Its / It's / Itself* dials can reveal the date of the month in any year up to 9999. 8. On May 25, 1961, only 20 days after Alan Shepard had become the first American to reach space, President John F. Kennedy told the United States, "I believe that this nation should commit *it / its / it's / itself* to achieving the goal, before the decade is out, of landing a man on the moon and returning *he / him / his / himself* safely to Earth."

2.5. Fill in the gaps with *some, any, no* or their derivatives.

1. There were ___ of my friends there and we had a very good time together. 2. Well, anyway, there is ___ need to hurry, now that we have missed the train. 3. Have you ever seen ___ of these pictures before? 4. There is ___ water in the kettle: they have poured it all out. 5. If you add ___ water into lime, you will see the result immediately. 6. Can I have ___ milk? — Sure. Look if there is ___ in the fridge. 7. Have you bought ___ cheese? 8. Give me ___ books, please. I have ___ to read at

home. 9. Put ___ sugar in her tea: she does not like sweet tea. 10. Is ___ the matter with you? Has ___ offended you? I see by your face that ___ has happened. 11. We did not see ___ in the hall. 12. ___ wanted to watch TV any more. There was ___ interesting. 13. He is busy. He has ___ time to go to the cinema with us. 14. Do you need ___ books to prepare for your report? 15. Do you have ___ questions? Ask me ___ you like, I will try to answer ___ of them. 16. He was ___ to be found.

2.6. Fill in the gaps.

1. ___ plants and animals are shrinking in size as the planet warms.

a) much b) many c) little d) a little

2. Reindeer can see ultraviolet wavelengths, which may help ___ view contrasts in their mostly white environment.

a) they b) them c) their d) theirs

3. Some wasps recognize other wasp faces better than ___ other kind of object.

a) any b) some c) nothing d) anything

4. My sister is in ___ thirties.

a) his b) her c) she d) its

5. There is ___ evidence that the Vikings had horns on their helmets.

a) any b) nothing c) no d) something

6. They don't know ___ about car engines.

a) nothing b) something c) anything d) everything

7. Harrison Ford has a spider named after ___: The Calponia harrisonfordi.

a) her b) him c) his d) it

8. George knows ___ about computers.

a) much b) many c) plenty d) lots

9. Look! There ___ so much water in the street.

a) is b) were c) was d) are

10. Although Mozart is buried ___ in Vienna's St. Marx cemetery, the exact location is unknown.

a) nowhere b) anywhere c) somewhere d) somebody

11. Asteroid Vesta is not an asteroid at all: ___ is actually a baby planet.

a) him b) this c) he d) it

12. I heard a knock on the door but when I opened it there was ___ outside.

a) some b) nobody c) anyone d) anything

13. In winter there ___ usually much snow in England.

a) were b) weren't c) isn't d) doesn't

14. The world's smallest steam engine is just ___ micrometers across and made from a tiny plastic bead floating in water.

a) a few b) a little c) little d) much

15. Can you see ___ mistakes in this sentence?

a) some b) any c) no d) much

16. Can I have ___ more coffee?

a) some b) any c) nothing d) many

17. Unfortunately, he has ___ chances of success.

a) some b) any c) few d) many

3. ПРИКМЕТНИКИ І ПРИСЛІВНИКИ (ADJECTIVES AND ADVERBS)

Утворення прикметників

іменник + суфікс					
-al form**al**	**-ful** use**ful**	**-ous** danger**ous**	**-y** rain**y**	**-less** – з заперечним відтінком: use**less**	**-ic** magnet**ic**

дієслово + суфікс		
-able, -ible change**able**	**-ant, -ent** differ**ent**	**-ive** attract**ive**

префікс + прикметник (з заперечним відтінком)		
in-, im-, il-, ir- **in**definite**, im**possible, **il**legal, **ir**regular	**un-** **un**expected	**dis-** **dis**proportional

Ступені порівняння прикметників

І спосіб

Порівняльний ступінь: Adjective + **-er**		Найвищий ступінь: Adjective + **-est**
односкладові	двоскладові, з наголосом на 2 складі	двоскладові, які закінчуються на ***-er, -ow, -y, -le***
big – bigger – biggest high – higher – highest	polite – politer – politest	clever – cleverer – cleverest narrow – narrower – narrowest easy – easier – easiest simple – simpler – simplest

II спосіб

Порівняльний ступінь: **more** + Adjective Найвищий ступінь: **the most** + Adjective
для багатоскладових та інших прикметників
beautiful – more beautiful – the most beautiful

Винятки

Звичайний ступінь	Порівняльний ступінь	Найвищий ступінь
good	better	the best
bad	worse	the worst
many (much)	more	the most
little	less	the least
far	farther / further	the farthest / the furthest
old	older / elder	the oldest / the eldest

Приклади

He is in the farthest corner of the garden. – Він у самому дальньому куточку саду.
Further information will be given later. – Наступну інформацію Ви отримаєте пізніше.
He is 5 years older than me. – Він старший за мене на 5 років.
He is my elder brother. – Він мій старший брат.

Прислівники

Тип	Приклади	Вживання
Прислівники місця	here, there, far, near	після дієслова в кінці речення
Прислівники способу дії	well, fast, slowly, carefully	після дієслова в кінці речення
Прислівники часу	today, tomorrow, now, daily, once, lately, recently	зазвичай в кінці речення
	always, often, usually, ever, never, regularly, seldom, sometimes	перед змістовим дієсловом але після дієслова *to be*
	already, just, since, still	частіше перед змістовим дієсловом

Тип	Приклади	Вживання
Прислівники міри та ступеня	much, little	в кінці речення
	very, too, so, rather, quite, pretty, slightly, absolutely	перед прикметником

Утворення прислівників

Іменник + ***-ly***	Прикметник + ***-ly***	Числівник + ***-ly***
weekly	highly	firstly

Ступені порівняння прислівників

Звичайний ступінь	Порівняльний ступінь	Найвищий ступінь
Односкладові fast	faster	(the) fastest
Два та більше складів carefully	more carefully	(the) most carefully

Винятки

Звичайний ступінь	Порівняльний ступінь	Найвищий ступінь
well	better	(the) best
badly	worse	worst
little	less	least
far	farther/ further	farthest/ furthest

Порівняльні конструкції

Звичайний ступінь

as ... as	– такий же ... як

It is as cold today as it was yesterday. – Сьогодні так само холодно, як і вчора.

Запам'ятайте!

This box is **twice** (three times) **as** heavy **as** that. – Ця коробка **вдвічі** (втричі) **важча**, ніж та.

not so (as) ... as	– не такий ... як

It is not so cold today as it was yesterday. – Сьогодні не так холодно, як учора.

Порівняльний ступінь

than	– ніж

He did more than she did. – Він зробив більше, ніж вона. (Він зробив більше від (за) неї).

the ... , the...	– чим ... тим

The more, the better. – Чим більше, тим краще.

Запам'ятайте словосполучення!

as soon as – як тільки
as long as – 1) оскільки; 2) поки
as far as I know (understand) – наскільки я знаю (розумію)
as long ago as in ... (as early as) – ще в ... (про час)

Приклади

Call me **as soon as** he comes. – Подзвоніть мені як тільки він прийде.

As long as he is busy, this task will be given to somebody else. – Оскільки він зайнятий, це завдання буде передано комусь іншому.

You can keep this book **as long as** you want. – Ви можете тримати цю книжку скільки завгодно.

As far as I know, there is no liquid water on the Moon. – Наскільки я знаю, на місяці немає води у рідкому стані.

The existence of a neutrino was predicted **as long ago as** in 1931 by Pauli. – Наявність нейтрино була передбачена Паулі ще в 1931 році.

3.1. Form adjectives using suffixes.

To change, comfort, agriculture, history, biology, centre, nature, geography, industry, post, to type, talent, gift, skill, beauty, care, event, joy, peace, to act, atom, electron, hero, to create, to express, end, friend, hope, help, danger, victory, noise, cloud, wind, rain.

3.2. Make adjectives negative using prefixes.
Possible, known, mobile, interesting, obedient, probable, comfortable, usual, polite, expected, connected, happy, important, honest, healthy, skilled, legal, similar, regular.

3.3. Derive nouns from adjectives. Use a dictionary if necessary.
Distant, independent, scientific, creative, universal, practical, planetary, peaceful, mathematical, physical, electrical, chemical, biological, difficult, solar, lunar, stellar.

3.4. Give comparative and superlative forms of the adjectives and adverbs.
1. Hot, long, short, clever, silly, great, red, black, white, thin, thick, fat, nice, warm, cold, merry, small, old, high, weak, little, heavy, light, green, dry, good, dirty, bad, deep, far, fast.
2. Necessary, polluted, fascinating, dangerous, quickly, slowly, clearly, widely.

3.5. Choose the correct option.
1. My room-mate gets up early / earlier / the earliest than me. 2. Of all my previous cars my new one works well / better / the best. 3. I can't understand you. Could you speak slow / more slowly / slower? 4. Do you think they behaved stupid / stupidly / more stupider? 5. Will you drive a little carefully / more carefully / more carefuller? 6. He works really hard / hardly / the hardliest. 7. The car moves twice fastlier / more faster / faster.

3.6. Translate into English using comparative constructions.
1. Юпітер приблизно у 318 разів більший за Землю. 2. Новий двигун набагато надійніший за старий. 3. Птах Ківі такого ж розміру як і курка, але її яйце вагою один фунт у шість разів більше за куряче. 4. Матеріал графен твердіший за діамант. 5. Цей розчин не такий прозорий, як був раніше. 6. Лондон був заснований ще у першому столітті нашої ери. 7. Літаючі рептилії ери динозаврів, які називаються птерозаври, були на зріст як жирафи та мали розмах крил завширшки зі шкільний автобус.

3.7. Translate the sentences into your native language paying attention to the construction *the ... the*.
1. The higher the voltage, the higher the current. 2. The higher the density of a liquid, the higher its boiling point. 3. The lower the friction, the higher the performance.

4. The higher the rotation speed of a hard disk, the higher the data transfer rate, but also its temperature and noise. 5. The higher the temperature of a liquid, the lower its viscosity. 6. The higher the load capacity of a lift, the lower its speed. 7. The shorter the wavelength, the greater the photon's energy. 8. The heavier the spaceship, the more fuel it consumes. 9. The heavier the nuclei, the less stable they are. 10. The longer the lever arm, the higher its elevating force.

3.8. Fill in the gaps with a proper degree of comparison of the adjective in the brackets. Add *than, the* or *as* if necessary.

1. Oxygen is ___ element in the earth's crust. (abundant) 2. Oil is much ___ water. (viscous) 3. TV was available in homes ___ the first working computer was demonstrated. (early) 4. Soccer isn't ___ in the US as baseball. (popular) 5. That was ___ computer game I have ever played. (good) 6. It is much ___ to write a resume when you have a good sample. (easy) 7. Which is ___ building in the world? (tall) 8. ___ one knows, ___ one believes. (much, little) 9. The pen is ___ the sword. (mighty) 10. Muckanaghederdauhaulia is ___ English place-name in Ireland. (long)

3.9. Fill in the gaps.

1. The ___ shark is the Shortfin Mako, which can swim up to 60 miles per hour.
a) fast b) faster c) fastest
2. The world's heaviest man on record at 1400 lbs is nearly 44 times ___ than the world's smallest man at 32 lbs.
a) heavyer b) heavier c) heavy
3. Noise pollution is forcing some birds to sing at higher frequencies, making them ___ attractive.
a) little b) littler c) less
4. The ___ way to get out of quicksand is to relax and float on your back.
a) good b) better c) best
5. The ___ haste, the ___speed.
a) more, less b) much, little c) most, least
6. ___ I know, English is now spoken all over the world.
a) as far as b) so long c) as soon as
7. As a rule, the ___ the shop, the better the service.
a) expensiver b) more expensive c) most expensive
8. Pelicans can plunge into the water from ___ 65 feet.

a) as higher as b) the highest c) as high as

9. Saccharin is 500 times ___ than sugar and is made from a compound of toluene, which is a solvent derived from petroleum.

a) sweet b) sweetest c) sweeter

10. The ___ mammal on earth is the tree sloth. It moves at 6 feet per minute.

a) slow b) slower c) slowest

11. Your mobile phone could be ___ than 400 times ___ powerful than the computers that helped NASA astronauts land on the moon in 1969.

a) more, more b) more, much c) much, most

12. The ___ you climb, the harder you fall.

a) highest b) higher c) high

13. A healthy human hair is almost ___ copper wire of the same diameter.

a) so strong than b) stronger than c) as strong as

14. This was the ___ moment I have ever experienced.

a) worst b) baddest c) worse

15. Her ___ sister is a chief accountant.

a) elder b) older c) the oldest

16. ___ than 200 million tons of human waste goes untreated every year.

a) Many b) Much c) More

17. The venom of the box jellyfish is among ___ in the world. It has caused at least 5,567 human deaths since 1954.

a) powerful b) the powerfulest c) the most powerful

18. They have found ___ solution ever.

a) the worst b) a worse c) bad

19. The new engine will produce up to 80 per cent fewer toxins ___ a typical internal combustion engine.

a) as b) than c) so

20. A new meteorite from Mars has 10 times ___ water as any previous Martian sample.

a) as much b) more c) so much

21. The ___ the earthquake, the ___ the damages.

a) stronger, greater b) strongest, greatest c) strong, great

22. Astronomers have found the ___ thing in the Universe: an enormous collection of galaxies which stretch to more than one billion light years across.

a) big b) bigger c) biggest

4. ЧИСЛІВНИКИ (NUMERALS)

Кількісні числівники

Відповідають на питання *скільки?*

Утворення

Числа	Числівники
0 – 9	zero, one, … nine
10, 11, 12	ten, eleven, twelve
13 – 19	thir**teen**, four**teen**, … nine**teen**
20 – 90	twen**ty**, thir**ty**, … nine**ty**
21, …, 99	twenty-one, … thirty-seven, … ninety-nine
100 – 900	one hundred, two hundred, ... nine hundred
101, … 999	one hundred **and** one, seven hundred **and** forty eight, nine hundred **and** ninety nine
1000, 99,000	one thousand, ninety-nine thousand
1,000,000 …	one million
21,734,119	twenty-one million seven hundred and thirty-four thousand one hundred and nineteen

NB Кожні три розряди чисел (справа наліво) відокремлюються комою: 2,437; 5,789,240.

Порядкові числівники

Відповідають на питання *котрий?*

Утворення

Числа	Числівники
1, 2, 3	first, second, third
5, 6, 7, 8, 9, 10, 11, 12	fif**th**, six**th**, seven**th**, eigh**th**, nin**th**, ten**th**, eleven**th**, twelf**th**
13 – 19	thirteen**th**, fourteen**th**, … nineteen**th**
20 – 90	twen**tieth**, thir**tieth**, … nine**tieth**
21, …, 99	twenty-**first**, … thirty-**seventh**, … ninety-**ninth**
3,472	three thousand four hundred and seventy **second**

Правила читання

Роки	
у 1897 році	in eighteen ninety-seven
у 2018 році	in two thousand eighteen
у 1907 році	in nineteen ***[ou]*** seven
у 1900 році	in nineteen hundred
Дати	
21-го серпня	on the twenty-first of September
Час	
о другій годині дня	at two o'clock pm (in the afterneoon)
о другій годині ночі	at two o'clocl am (in the morning)
о 5-30 утра	at half past five am
о сьомій годині дванадцять хвилин	at twelve minutes past seven
без п'ятнадцяти шість	at a quarter to six
Дробові числа	
1/2	a half
1/4	a quarter
3/4	three quarters
1/3	one third (of an apple)
2/5	two fifths (of an apple)
1 1/10	one and one tenth (apples)
0.17	zero point seventeen
0.12345	zero point one two three four five

Математичні операції та функції

+ – plus	$\sqrt[n]{\ }$ – *n*-th root of
- – minus	$\sqrt{\ }$ – square root of
× – times; multiplied by	$\sqrt[3]{\ }$ – cube root of
/ – divided by	5^2 – five squared
= – is; equals; is equal to	5^3 – five cubed
10% – ten per cent	2^5 – two to the fifth power; two to power five
> – more than; < – less than	f(x) – *f* of *x*

4.1. Write down in English.

1.	158	11.	дванадцятого січня
2.	1,379,017	12.	у 1994 році
3.	15 автомобілей	13.	о пів на шосту
4.	11 відсотків	14.	без п’ятнадцяти вісім
5.	перший	15.	$200
6.	другий	16.	4+9=13
7.	п’ятий	17.	7×6=42
8.	тридцять сьомий	18.	$\sqrt{64}=8$
9.	двісті сорок дев’ятий	19.	2^{10}=1024
10.	двадцять третього вересня	20.	1.0043 метра

4.2. Write down in English.

9, 11, 20, 33, 45, 89, 100, 400, 721, 999, 1535, 276498, 3100001, 2/3, 5/12, 1/100, 1/1000000, 0.987654321, 5.35, 1.00001.

4.3. Translate into English:

третій рік; дев’ятий день; тринадцятий поверх; двадцять сьома літера; дев’яносто дев’ятий зразок; сьоме січня 1900 р.; двадцяте березня 2000 р.; двадцять третє грудня 2002 р.; він народився 3 лютого 1900 р.; він приїхав 22 травня 2013 р.; 2 відсотки; 45 відсотків; 200 відсотків.

4.4. Render the sentences in English. Remember: *length – long, width – wide, height – high, depth – deep, thickness – thick;* **but** *weight – to weigh*. **E.g.:** *The length of this ruler is 25 centimetres. = This ruler is 25 centimetres long. The weight of the box is 1,5 kg. = The box weighs 1,5 kg.*

1. Висота башти Біг Бен – 96 метрів. 2. Товщина цього дроту – 2 міліметри. 3. Довжина Дніпра – приблизно 2000 кілометрів. 4. Максимальна глибина озера Лох Несс – 230 метрів. 5. Тунель Великого адронного колайдера 3 метри завширшки. 6. Опори високовольтних ліній електропередач в Британії можуть сягати 55 метрів заввишки. 7. Кремнієві кристали, що використовуються для виготовлення інтегральних схем, завтовшки тільки 200-300 нанометрів. 8. Довжина ліній лондонського метро – 402 кілометри. 9. Ця валіза важить

більше 20 кілограмів. 10. Один кубічний метр ртуті важить 13,5 тон, а залізо такого ж об'єму майже вдвічі легше і важить трохи менше 8 тон.

4.5. Choose the correct translation.

1. Двадцять друге травня
a) twenty-two of May b) twenty-second May c) the twenty-second of May
2. Третій
a) three b) threeth c) the third
3. П'ятнадцять
a) fiveteen b) fifteen c) fifty
4. Дев'ятий
a) the ninth b) the nineth c) nine
5. Дванадцятого серпня
a) on the twelveth of August b) on the twelve of August c) on the twelfth of August
6. Дев'яносто
a) nineteen b) ninetie c) ninety
7. 342
a) three hundreds and forty-two b) three hundred and forty-two
c) three hundred forty two
8. 4,837,905
a) four million eight hundred thirty-seven thousand nine hundred five
b) four millions eight hundreds and thirty-seven thousands nine hundreds and five
c) four million eight hundred and thirty-seven thousand nine hundred and five
9. Тисячний
a) thousandth b) the thousandth c) thousand
10. Три мільйони
a) three millions b) three millionth c) three million
11. Сотні книг
a) hundreds of books b) hundreds books c) hundred of books
12. Одна третя
a) one thirds b) one three c) one third
13. П'ять восьмих
a) five eighth b) five eightth c) five eighths
14. В п'ятдесят першій кімнаті
a) in room fifty-first b) in the room fifty-one c) in room the fifty-one

15. Сьома глава

a) chapter seventh b) chapter seven c) the chapter seven

16. 2.64

a) two dot sixty-four b) two and sixty-four c) two point sixty-four

17. 0.39 тон

a) zero point thirty-nine ton b) zero point thirty-nine tons c) zero point thirty-nine of a ton

18. 7.26 грамів

a) seven point two six of grams b) seven point two sixth grams

c) seven point two six grams

19. 564 рік до нашої ери

a) five hundred and sixty-four AD b) five and sixty-four BC

c) five hundred sixty-four BC

20. У 1900-му році

a) in nineteen hundredth year b) in nineteen two zeroes c) in nineteen hundred

21. 75 %

a) seventy-five percent b) seventy-five percents c) seven five procent

22. 2×3=6

a) two times three is six b) two time three – six c) two star three is six

23. 2^{10}

a) two in the tenth power b) two to the tenth power c) two by the tenth power

24. a = b

a) a equals b b) a is equal b c) a equals to b

25. $\sqrt{25} = 5$

a) square root from twenty-five – 5 b) square root twenty-five is five

c) square root of twenty-five is five

5. ПРИЙМЕННИКИ (PREPOSITIONS)

Прийменники – це службові слова, які використовуються для логічного зв'язку слів у реченні. За функцією прийменники вказують на:

- місце (***in, at, on, behind, before*** etc);
- напрямок (***to, into, towards, from*** etc);
- час (***in, at, on, during, after, since*** etc);
- інструмент, виконавця (***by, with***) тощо.

Функція	Приклади		Переклад
Час	in	the morning (afternoon, evening)	вранці (вдень, ввечері)
		spring (summer, winter, autumn)	навесні (влітку, взимку, восени)
		September (January, May)	у вересні (у січні, у травні)
		2008	у 2008 році
		two hours	через 2 години
	on	Tuesday (Friday)	у вівторок (у п’ятницю)
		the first of June	першого червня
		vacation	на канікулах
	at	five o’clock	о п’ятій годині
		night	вночі
		noon (midnight)	о полудні (о півночі)
		Christmas	у Різдво
Місце	in	the room (pocket)	в кімнаті (в кишені)
		the street	на вулиці
		the tree	на дереві
	on	the shelf (surface)	на полиці (на поверхні)
	at	the bus stop	на зупинці автобуса
		the cinema (theatre)	в кіно (в театрі)
		the stadium (station)	на стадіоні (на станції)
		the door (window)	біля дверей (біля вікна)
		work (home)	вдома (на роботі)
		at the university (plant)	в університеті (на заводі)
Напрямок (to go, run, jump etc.)	to	the park (the station)	у парк, до станції
	over	the fence	через паркан
	through	the forest	через ліс
	across	the square	через площу
Приналеж-ність	of	the students *of* our group	студенти нашої групи
Інструмент	with	to write *with* a pen	писати ручкою
	by	to write (copy) *by* hand	писати (копіювати) вручну
Виконавець	by	built *by* the Romans	побудований римлянами
Напрямок дії	to	send a message *to* everybody	надіслати повідомлення всім

Запам'ятайте! Значення прийменника можна зрозуміти тільки в контексті.

Запам'ятайте! Прийменники не вживаються:
next week – наступного тижня;
last Monday – минулого понеділка;
this year – цього року.
Наприклад: I saw my friend last month. They will take the exams next week.

5.1. Fill in the gaps with *at*, *in* or *on* if necessary.
1. There are some flowers ___ the windowsill. 2. Jane was looking for her driving license and finally found it ___ the side-pocket of her coat. 3. Is there anything interesting ___ TV today? 4. He is lucky to be studying ___ this University. 5. Specialists advise not to store files ___ the desktop. 6. ___ July we will take exams in English. 7. You can find the list of irregular verbs ___ the Appendix. 8. Our English classes are ___ Tuesdays. 9. I'm so glad to see you. Please, feel ___ home. 10. You may wait for her here. She'll be back ___ a few minutes. 11. Valentine's Day is celebrated ___ the 14-th of February. 12. We are expecting a big tourist season ___ next year. 13. He doesn't like to work late ___ the evening. 14. She is likely to come back ___ 5 o'clock.

5.2. Fill in the gaps with prepositions.
___ June 2012, scientific world celebrated the 100th anniversary ___ the birth ___ Alan Turing, a man regarded as one ___ the most influential mathematicians ___ the 20th Century. He is best known ___ his work cracking the Germans' secret codes ___ the Second World War. He is also regarded as one ___ the pioneers ___ computer technology. An exhibition devoted ___ his life and achievements opened ___ the Science Museum ___ London ___ 21 June, 2012.

5.3. Fill in the gaps with prepositions if necessary.
1. Humans first landed ___ the Moon ___ July 1969. 2. The microwave oven was discovered ___ an American scientist Percy Spencer ___ the late 40s. 3. After returning ___ a two-week vacation ___ 1928, Fleming noticed that one ___ his Petri dishes was home ___ a mysterious mould. 4. "Google Maps" lets users view maps ___ specific regions and get directions ___ one location ___ another. 5. NASA cooperates ___ many scientific and research companies. 6. Gravitational force

depends ___ the mass ___ the body. 7. A Mars Rover was sent ___ the Red Planet ___ 2004 and was guided ___ engineers ___ Earth. 8. Iron is relatively easy to shape ___ various forms. It has been useful ___ people ___ thousands ___ years. 9. It takes a year and 6 hours ___ the Earth to revolve ___ the Sun. 10. Sunlight actually is made up ___ a bunch ___ different colours, all ___ which have different wavelengths. 11. Rainbows are caused ___ the droplets ___ water that remain suspended ___ the atmosphere ___ a rainstorm. 12. How to get ___ Shevchenko Garden? – You can go there ___ bus, ___ trolleybus or just ___ foot. It's quite near.

5.4. Fill in the gaps ("-" means that nothing should be inserted).

1. Molecules consist ___ atoms.
a) in b) of c) on
2. The train arrives ___ Kiev ___ 6-30 a.m.
a) in, at b) at, at c) to, in
3. Yesterday ___ the cinema we met a famous movie star.
a) in b) at c) on
4. The USA is washed ___ the Pacific Ocean ___ the west.
a) in, in b) -, from c) by, in
5. Very often our mood depends ___ the weather.
a) from b) of c) on
6. There are lots of useful gadgets ___ my backpack.
a) in b) at c) into
7. I have been waiting ___ the taxi for 20 minutes.
a) - b) on c) for
8. The ski contest will be held ___ Sunday.
a) in next b) on next c) next
9. I regret that I wasn't able to come ___ last week.
a) in b) - c) on
10. I am taking my driving test ___ 4.30 ___ the 4th of October.
a) in, - b) at, on c) on, at
11. My brother was born ___ 1990.
a) in b) at c) on
12. He said he would return ___ five minutes.
a) after b) in c) over
13. Our university was founded ___ the 19th century.

a) on b) at c) in
14. We are looking forward ___ the summer holidays.
a) at b) for c) to
15. She looked ___ herself ___ the mirror.
a) to, on b) at, in c) on, through
16. Is he going to enter ___ the University?
a) to b) in c) -
17. I cannot write ___ my left hand.
a) with b) by c) in
18. He goes ___ the swimming pool twice a week.
a) in b) to c) at
19. He goes to the University ___ underground.
a) in b) by c) on
20. I can never find him ___ home ___ this time of the day.
a) -, - b) in, in c) at, at

6. ДІЄСЛОВО *TO BE*

Функції та значення	**Приклади**
1. Смислове дієслово зі значенням «бути», «знаходитись». У реченні після нього вживається іменник з прийменником або прислівник.	He is at home. – Він вдома. Our institute is in the center of the city. – Наш інститут знаходиться у центрі міста.
2. Дієслово-зв'язка. Після нього можуть вживатися іменник або прикметник	My friend is a designer. – Мій друг – конструктор. This substance is poisonous. – Ця речовина отруйна.
3. Допоміжне дієслово: а) для формування часів групи Continuous; б) для формування пасивного стану.	He is making an experiment. – Він проводить експеримент. This book was written last year. – Ця книга була написана минулого року.
4. Модальне дієслово у значенні «повинен»: ***to be to + V***	He is to come at 7. – Він повинен прийти о сьомій.

Відмінювання дієслова *to be* у Present Indefinite Tense		
Особа	**Однина**	**Множина**
I	I ***am***	We ***are***
II	You ***are***	You ***are***
III	He, she, it ***is***	They ***are***

Приклади: He ***is*** a student. He ***is not*** (***isn't***) a student. ***Is*** he a student?

Відмінювання дієслова *to be* у Past Indefinite Tense		
Особа	**Однина**	**Множина**
I	I ***was***	We ***were***
II	You ***was***	You ***were***
III	He, she, it ***was***	They ***were***

Приклади: He ***was*** a student. He ***was not*** (***wasn't***) a student. ***Was*** he a student?

Відмінювання дієслова *to be* у Future Indefinite Tense		
Особа	**Однина**	**Множина**
I	I ***will be***	We ***will be***
II	You ***will be***	You ***will be***
III	He, she, it ***will be***	They ***will be***

Приклади: He ***will be*** a student. He ***will not (won't) be*** a student. ***Will*** he ***be*** a student?

Структура *There is ... There are ...*

Є найбільш поширеною конструкцією з дієсловом ***to be*** (в різних часових формах). Вона використовується, коли треба повідомити, що деякий об'єкт знаходиться в певному місці. Англійське речення в такому випадку перекладається з кінця (з обставини місця). Наприклад:

There is a new printer **in our office**. – **В нашому офісі** є новий принтер.

There are lots of formulae **in this text-book**. – **В цьому підручнику** багато формул.

Якщо обставина місця відсутня, то речення перекладається, починаючи з дієслова:

There is only one solution of this problem. – **Існує** тільки одне рішення цієї проблеми.

Питальна форма.

Is there a printer in your office? – У вашому офісі є принтер?

Заперечна форма.

There is no printer in our office. – У нашому офісі немає принтера.

6.1. Put down interrogative and negative forms of the sentences.

1. I am very busy currently. 2. The tests are over. 3. The machine-tool is in the repair station. 4. My watch was out of order. 5. These positions were vacant. 6. His knowledge will be much better if he works harder. 7. There is a new installation at our laboratory. 8. There are some interesting articles on this subject. 9. There were some impurities in this liquid.

6.2. Put the verb *to be* in the proper form of Present Indefinite Tense.

1. I ___ a fourth year student. 2. She ___ busy with her diploma work. 3. ___ you sure that the result ___ correct? 4. EasyJet flight tickets ___ rather cheap. 5. My sister ___ a post-graduate. 6. We ___ never late for classes. 7. These computer parts ___ no more available. 8. The engine ___ idle at the moment. 9. Where ___ you now? 10. Why ___ the light off? 11. There ___ a nice small cafe near our institute. 12. ___ there any mistakes in my paper? 13. There ___ much snow this year. 14. Why ___ there no handle on this door? 15. For every person there ___ roughly 170 million insects. 16. Where there ___ a will, there ___ a way.

6.3. Put the verb *to be* in the proper form.

1. There ___ distinct differences between crystalline solids and amorphous solids. 2. Nicolaus Copernicus ___ the first person to apply modern scientific processes to the study of space. 3. There ___ three female pharaohs in Ancient Egypt, of whom the greatest ___ Hatshepsut (reigned 1498-1483 B.C.). 4. The next step in man-computer communication ___ no-touch interfaces. 5. Before home refrigerators ___ common, people relied on iceboxes to store their food. 6. Single chips with memory comparable to today's high-capacity disk drives ___ a reality in just a few years. 7. The USA's daily oil consumption ___ about 20.7 million barrels. 8. In future, instead of a music

system, television, media player, PC and a home theatre there ___ a single device that will do all of the above. 9. The asteroid 2012 DA14, which flew past Earth on the 15th of February, 2013 and exploded over Russia, ___ about 50 feet in diameter. 10. Polar ice caps, glaciers and wandering icebergs ___ about 75 percent of the world's fresh water. 11. Analysts say, augmented reality glasses and Smartwatch ___ available soon enough. 12. There ___ more ways to the wood than one.

6.4. Fill in the gaps.

1. There ___ five Great Lakes in the north of the USA.
a) were b) are c) is
2. Steve ___ on a business trip last month.
a) was b) am c) are
3. Who ___ the inventor of a light bulb?
a) is b) am c) are
4. Where ___ you yesterday?
a) are b) were c) was
5. Your results ___ better if you work hard.
a) will b) were c) will be
6. ___ the best day in my life when we met.
a) There was b) It was c) There were
7. Look! ___ so many beautiful flowers in the garden..
a) There are b) It is c) There were
8. The first mathematician to calculate Pi with reasonable accuracy ___ Archimedes, around 250 B.C.
a) is b) were c) was
9. There ___ no volcanoes in Australia.
a) are b) is c) will be
10. People who live in Los Angeles ___ called Angelenos or Angelinos.
a) am b) are c) is
11. Did you encounter any problems when you ___ in your first year at the university?
a) was b) were c) are
12. The number of possible forms of complex ice crystals ___ greater than the number of atoms within the universe.
a) are b) to be c) is

13. ARPANET ___ the world's first computer network which later developed into Internet.
a) was b) is c) were
14. The President ___ on the air tonight.
a) to be b) will c) will be
15. Why ___ you absent the whole last week?
a) was b) will c) were
16. I hope she ___ interested in my plan.
a) will b) will be c) be
17. Everybody ___ able to learn a foreign language. It's not so difficult.
a) is b) are c) to be
18. The young Abraham Lincoln ___ known for his interest in engineering and mechanics.
a) was b) to be c) were
19. There ___ about 20,000 different species of bees in the world.
a) are b) is c) be
20. In early 1970s, ___ no cordless telephones or cellular phones yet.
a) there was b) it was c) there were
21. The word *laser* ___ an acronym for "light amplification by stimulated emission of radiation".
a) it is b) there is c) is
22. ___ electrons that are responsible for electric current in conductors.
a) There is b) It is c) There are

7. ДІЄСЛОВО *TO HAVE*

Відмінювання дієслова to have (мати) в Present Indefinite Tense		
Особа	**Однина**	**Множина**
I	I ***have***	We ***have***
II	You ***have***	You ***have***
III	He, she, it ***has***	They ***have***

Приклади: 1. He ***has*** a dog. 2. He ***does not (doesn't) have*** a dog. 3. ***Does*** he ***have*** a dog?

Past Indefinite Tense – *had*

Приклади: 1. I ***had*** a bicycle. 2. They ***did not*** (***didn't) have*** any time to meet us. 3. ***Did*** you ***have*** a pet when you were a child?

Future Indefinite Tense – *will have*

Приклади: 1. I ***will have*** time to help you tomorrow. 2. They ***will not (won't) have*** much money. 3. ***Will*** you ***have*** musicians at your party?

Запам'ятайте!

to have = to have got

Приклади: 1. He ***has got*** a dog. 2. He ***has not (hasn't) got*** a dog. 3. ***Has*** he ***got*** a dog?

Запам'ятайте!

to have dinner (breakfast, lunch, supper)
to have a cup of tea (a cigarette, a meal, a drink)
to have a shower (a bath, a sleep, a rest, a talk, a chat)
to have a good time

7.1. Write the negative and interrogative forms of the sentences.

1. My friend has a wonderful collection of stamps. 2. Tomorrow we will have dinner together. 3. Two years ago I had poor knowledge of this subject. 4. This town has a long history. 5. This device has many advantages. 6. This young man had a strong desire to enter a University. 7. This cable has a strong sheath. 8. These emissions will have little effect on the environment. 9. He has a good command of English.

7.2. Fill in the gaps with the proper form of the verb *to have.*

1. He ___ no access to these data. 2. Yesterday I ___ a terrible toothache. 3. We ___ many acquaintances in our town. 4. They ___ much to do tomorrow. 5. Our football team ___ a new coach. 6. ___ you ___ any problems with maths? 7. She (not) ___ any pets at home. 8. The new car ___ amazing speed. 9. Who ___ any questions? 10. When I saw her first she ___ a short haircut. 11. ___ you ___ a good time yesterday? 12. He always ___ lunch at 12 o'clock sharp.

7.3. Insert the verbs *to be, to have* in Present, Past or Future Indefinite.

1. Carbon dioxide ___ one of the chemicals that causes global warming. 2. Last year I ___ a trip to Ireland and I ___ amazed by the beauty of this country. 3. This magazine ___ nothing to do with science. 4. Silicon ___ a semiconductor and ___ a diamond lattice. 5. I called to the company yesterday and we ___ an appointment for next Tuesday. 6. She ___ an ear for music. 7. He (not) ___ a right to say so. 8. There ___ a conference on solar power engineering in Zurich next year. 9. When ___ you at the theatre for the last time? 10. ___ you ___ a degree in chemistry? 11. Chameleons ___ unique animal species that ___ an ability to change their skin colour depending on the environment. 12. What ___ you ___ for breakfast this morning? 13. There ___ different kinds of internal combustion engines. 14. The Japanese smiths ___ a secret technology of producing swords that ___ extremely sharp and durable. 15. The Americans ___ different system of measures, for example length ___ measured in inches, feet and miles. 16. One of the most important things to do before you travel abroad ___ to check your destination's passport and visa requirements. Every country ___ different rules, and it can take several weeks or months to obtain the proper documentation, so advance planning ___ crucial.

7.4. Fill in the gaps with the verbs *to be* and *to have*.

1. Did he ___ any mistakes in his paper?

a) has b) had c) have

2. Fermat's Last Theorem states that the equation $xn + yn = zn$ ___ no non-zero integer solutions for x, y and z when n ___ more than 2.

a) is, is b) have, has c) has, is

3. Today's sources of energy are more advanced than those people ___ 100 years ago.

a) have b) has c) had

4. I hope you ___ fun during your summer holidays.

a) will be b) will have c) will

5. The Gulf Stream ___ a strong influence on the weather in the British Isles.

a) have b) is c) has

6. The early bicycle ___ no pedals, and its frame ___ a wooden beam.

a) had, was b) has, is c) was, had

7. Scientists state that earthquakes ___ nothing to do with climate change.

a) have b) has c) are

8. Bad news ___ wings.

a) have b) has c) are
9. Our football team ___ a better chance to win next year.
a) have b) will has c) will have
10. In early 1900s, there ___ few women who ___ college degrees in the USA.
a) is, have b) was, had c) were, had
11. Asteroids sometimes ___ their own moons
a) have b) has c) are
12. Pig iron ___ got up to 5 percent carbon and ___ so hard and brittle that it ___ almost useless.
a) have, is, are b) has, is, is c) is, has, has
13. Hasty climbers ___ sudden falls.
a) have b) has c) are
14. Next decade, electric and hybrid vehicles ___ a growing presence in the market.
a) have b) will have c) have
15. Vitamin C ___ no significant prophylactic effect against the common cold.
a) have b) has c) to have
16. Avogadro's law states that at the same temperature and pressure, equal volumes of the gases ___ the same number of molecules.
a) have b) are c) has
17. ___ water ___ one oxygen with one hydrogen or one oxygen with two hydrogens?
a) Does, has b) Does, have c) Do, has
18. The technology of mind ___ profound consequences for humanity.
a) will have b) will be have c) will has

8. ТИПИ РЕЧЕНЬ, ПОРЯДОК СЛІВ У РЕЧЕННІ, ТИПИ ПИТАНЬ.

В англійській мові виділяють **4 типи речень**.
1. Стверджувальне: The students work in the laboratory twice a week.
2. Заперечне: The students do not work in the laboratory twice a week.
3. Питальне: Do the students work in the laboratory twice a week?
4. Спонукальне: Send me this document by E-mail. Do not touch this button.

Структура ствердного позитивного речення

Підмет	Присудок	Додатки		Обставини		
		прямий	непрямий	способу дії, цілі	місця	часу / частотності
Franklin	invented	the lightning conductor				
Computers	translate	texts		very quickly		
John	calls		me			every Sunday
They	will receive	an invitation	to the conference			next week
He	gave	the contract	to his partner	to sign it		
Franklin and his son	went				into the country	on a stormy day

Порядок слідування членів речення в англійській мові строго визначений.

У ствердному позитивному реченні порядок слів **прямий**. Це означає, що на першому місці в реченні зазвичай стоїть підмет, тобто основна дійова особа чи предмет, за яким безпосередньо слідує присудок, тобто дія, що виконується. Далі йдуть група об'єктів (якщо вони є) та обставини (теж у певному порядку).

Якщо обставина частотності виражена одним словом (*always, never, usually, often, rearly, seldom тощо*), то такі слова ставляться:

- між підметом і присудком, наприклад: *He always comes on time;*
- після дієслова *to be*: *He is never late. Houses are usually made of stone, bricks or wood;*
- після модальних дієслів *can, may, must*: *He can always ask me for help;*
- після допоміжних дієслів *will, would, have*: *He will never return. I have often seen him here.*

Обставини часу можуть також стояти на початку речення. В цьому разі вони зазвичай відокремлюються комою: *At the end of the course, students will pass an exam*.

Увага! Прямий порядок слів може порушуватись:

- у конструкції *there is / there are* (та інших часових формах)*:* ***There was*** *nothing new for me at the lecture.*
- якщо обставини місця ставиться на початку речення: ***Behind the house*** *grew an old oak tree.*
- у деяких емфатичних конструкціях: ***Never before*** *had I seen such a beautiful sunset.* ***Hardly*** *had he arrived,* ***when*** *the chief gave him another task.*

Структура ствердного негативного речення

Підмет	**Допоміжне дієслово (або *be*, або модальні)**	***not***	**Основне дієслово**	**Решта речення**
He	is	**not**	**-**	a student.
They	were		-	at home yesterday.
I	do		know	him.
He	does		study	physics.
She	is		waiting	for us.
He	did		come	to the seminar.
Jack	has		written	a thesis yet.
We	will		see	him soon.
He	can		speak	Chinese.

В усній мові частка *not* часто зрощується з допоміжним (модальним) дієсловом, утворюючи скорочення: *is not = isn't; are not = aren't; do not = don't; does not = doesn't; was not = wasn't; were not= weren't;* ***will not = won't****; have not = haven't; has not = hasn't; had not = hadn't.*

Увага! Скорочені форми **не вживаються** в офіційних, ділових та наукових документах.

Увага! Якщо у реченні використовується слово з негативним значенням, наприклад *never, nobody, nothing* тощо, то негативна частка **не вживається**. Приклади: He never watches TV. He saw nobody. (= He didn't see anybody.) I can see nothing. (I cannot see anything.)

Структура питального речення

Questions (Present simple)

Питальне слово (слова)	**Допоміж-не дієслово**	**Підмет**	**Дієслово дії**	**[решта речення]**	**Відповідь (підкреслена)**
-	-	Who	**lives**	in this house?	I live.
-	-	How many people	live	in this house?	5 people live in this house.
-	-	What	**takes**	the most time of your day?	My work takes the most time of my day.
-	-	What company	produces	these devices?	Nokia produces these devices.
-	Do	you	know	this man?	**Yes**, I do.
-	Does	he	like	cycling?	**No**, he doesn't.
Who	do (does)	you (he)	invite	to the party?	I invite my friends to the party.
What	do (does)	you (he)	do	in the evening?	I have dinner in the evening.
When	do (does)	you (he)	come	home?	I come home at 7 o'clock.
Where	do (does)	you (he)	live	?	I live in Hamburg.
Why	do (does)	you (he)	study	English?	I study English because I need it for my job.
How	do (does)	you (he)	get	to work?	I get to work by bicycle.
How often	do (does)	you (he)	have	your English classes?	I have my English classes once a week.
With whom	do (does)	you (he)	play	football?	I play football **with** my friends
Who				football **with**?	

Допоміжне слово у реченні має таку форму, яка визначає час, число та особу присудка; при цьому основне дієслово втрачає ці ознаки.

Tag questions

Утворюються як ствердне речення – позитивне чи негативне, до якого після коми додається допоміжне слово у формі, що відповідає присудку, та займеник, що відповідає підмету. Якщо ствердне речення позитивне, то допоміжне слово використовується у негативній формі, завжди скороченній, наприклад, *isn't, don't, haven't* тощо. І навпаки – якщо ствердне речення негативне, то допоміжне слово використовується у позитивній формі: *is, do, have*. Наприклад: John is at home, isn't he? You don't like cycling, do you?

Використовуються:

- для уточнення інформації, тоді інтонація питальної частини йде вгору;
- для ствердження відомого факту з метою підтримання бесіди, інтонація йде вниз.

8.1. Put the words in brackets into the proper place.

1. The dean is going to return after the meeting. (to his office) 2. He sent his CV yesterday. (you) 3. He usually comes in the afternoon. (to his office) 4. I will bring the papers later. (to you) 5. The light switches on at 6 o'clock. (automatically) 6. The Greek mathematician, physicist, engineer, inventor, and astronomer Archimedes lived in Syracure. (in the third century BC) 7. The first Greek were held in the city of Olympia in 776 BC. (Olympics) 8. Mars stores in polar ice caps. (its ice) 9. Bees move to indicate the direction of the food source. (in a figure-of-eight "dance") 10. The decimal Hindu–Arabic numeral system with zero was developed by around AD 700. (in India)

8.2. Put the modifiers of frequency in the proper place.

1. The Greeks and the Romans used zero. (never) 2. Although microbes can cause disease and infections in humans, they aren't harmful. (always) 3. You cannot see a ***force*** but you can see what it does. (often) 4. The word *robot* can refer to both physical and virtual software agents, but the latter are referred to as *bots* to differentiate. (usually) 5. Unfortunately, "free" services are actually free for users (seldom). 6. An avocado ripens on the tree, so farmers can use trees as storage and keep avocados

fresh for up to seven months. (never) 7. Social media offers real-time answers to pressing travel questions. (frequently)

8.3. Put the words in the correct order to make a sentence. The first word is indicated.

1. called Tube Underground also the **The** London is.
2. every **Trains** million travel year 43 the Tube miles in.
3. to network 250 **The** of tunnels miles extends.
4. average is on hour speed 20.5 **The** per the Underground miles.
5. stations are south Thames of of 10% **Less** than the.
6. 270 Underground stations has London **The**.
7. two is stations only **The** 260 between distance adjacent metres shortest.
8. was in on first installed 1911 escalator Underground **The** the.
9. third in system Europe busiest London Moscow metro Paris **The** Underground is and the, after.
10. underground % of above actually the 55 ground is **Around** London the.

8.4. Put the words in the correct order to make a sentence. The first word is not indicated.

1. use make bees to beehives hexagons their always.
2. in spherical are bodies celestial all shape not.
3. a diagonals of the intersect middle rectangle the in.
4. used in often equations Pi is mathematical.
5. 40,075 globe is at, the the kilometers equator the circumference of.
6. water faster hot cold than freezes water.
7. fluids is for often pressure calculated gases and.
8. prism basic a crystal the hexagonal is geometry snow most.
9. two dissects the congruent of a triangles each rhombus rhombus diagonal into.
10. Greek comes *table* or from the the *trapeza* trapezium originally word word.
11. of the made ice a of nucleus comet is usually.
12. the solar 76 inner Halley returns every system once Comet years the to.
13. robots the Japanese land space asteroid on next an will two month agency.
14. about United 2017 21st 216 viewed States eclipse people August in of on million the the the.

15. away is Milky the from approximately galaxy light-years Way our the center 26,000 of Sun.

8.5. Make the sentences negative.

1. This moon orbits in the same direction as its nearest neighbours. 2. This mineral is very rare. 3. This element bonds easily to nonmetals. 4. This chocolate melts in hot water. 5. 300 years ago, scientists wrote their papers only in Latin. 6. The Mars rover Opportunity has got stuck in a dust storm for ever. 7. We can watch the TV news via the Internet. 8. Antarctic glaciers will melt in 20 years. 9. Solar panels generate enough electricity to power an entire home. 10. Aluminum is more corrosion resistant than steel.

8.6. Translate the sentences into English.

1. Дві паралельні лінії на площині ніколи не перетинаються. 2. Жодна жива істота не може функціонувати без води. 3. Ніколи не використовуйте антибіотики для лікування вірусних інфекцій, таких як застуда чи грип. 4. На півночі Фінляндії сонце зовсім не заходить протягом 60 днів влітку. 5. Ці дорогоцінні камені не можна знайти більше ніде в світі, окрім цього місця. 6. Ніхто не знає, хто створив біткоїн. 7. Наявність диплома про вищу освіту нічого не означає, якщо ви не маєте відповідних професійних навичок. 8. Чорні діри не випромінюють світло. 9. Пасажирам не дозволяється користуватись електронними пристроями під час зліту та посадки. 10. Тести показали, що цей продукт не містить шкідливих речовин.

8.7. Choose one of the options

1. Who ___ the name of this company? – I know.
a) knows b) does know
2. How many people ___ in this house? – 10 people live in this house.
a) live b) does live
3. What ___ you happy? – Chocolate makes me happy.
a) makes b) does make
4. What colour ___ me best? – Blue matches you best of all.
a) matches b) does match
5. What animals ___ in this forest? – Only foxes and wolves lived in this forest.
a) lived b) did live

6. Who ___ to your party? – I invited Tom and Jerry.
a) you invited b) did you invite
7. How many people ___ ? - I know about 1000 people.
a) you know b) do you know
8. How many people ___ yesterday? – I met nobody.
a) you met b) did you meet
9. What colour ___? – I like yellow.
a) you like b) do you like
10. What animals ___ in the zoo? – I saw zebras an elephants.
a) you saw b) did you see
11. ___ you know this man? – Yes, I do.
a) do b) does
12. ___ his parents live in Kiev? – No. They live in Lviv.
a) do b) does
13. ___ rabbits eat meat? – No, they don't.
a) do b) does
14. ___ all the students pass exams? – Yes. They do
a) do b) does
15. ___ he speak French? - Yes. He does
a) do b) does
16. ___ she live in Kharkiv? - Yes. She does
a) do b) does
17. ___ your brother do sports? - Yes. He does
a) do b) does
18. ___ this telephone cost much? - Yes. It does
a) do b) does
19. ___ you listening to me? – Yes, I am.
a) is b) are
20. ___ you going to the cinema? – Yes, I am.
a) is b) are
21. ___ they playing tennis? – Yes, they are.
a) is b) are
22. ___ he talking to the dean? – Yes, he is.
a) is b) are
23. ___ she sleeping? – Yes, she is.

a) is b) are
24. When ___ you usually come home?
a) do b) does
25. When ___ he usually come home?
a) do b) does
26. Where ___ you live?
a) do b) does
27. Where ___ he live?
a) do b) does
28. Why ___ you think so?
a) do b) does
28. Why ___ he think so?
a) do b) does
29. How many times a week ___ you have English classes?
a) do b) does
30. How many times a week ___ he have English classes?
a) do b) does

8.8. Put questions to the underlined part of the sentence.

1. Vertical farms grow plants hydroponically (without soil) in large, multistorey buildings under artificial light. 2. The U.S. government banned many energy-inefficient incandescent light bulbs at the beginning of 2014 in favor of compact fluorescents and LEDs. 3. Rooftop wind generators for residential homes can generate up to half of your home's energy needs. 4. The company World View Enterprises wants to send tourists into the stratosphere, 32km above Earth, on hot air balloons. 5. The wheel was invented by Mesopotamians around 3500 B.C., to be used in the creation of pottery. 6. Internal combustion engine converts chemical energy into mechanical energy. 7. Scottish-born inventor Alexander Graham Bell got the first patent for an electric telephone in 1876. 8. The usage of tools started 2.6 million years back in Ethiopia. 9. A British scientist Michael Faraday discovered the basic principles of electricity generation. 10. 1956 Nobel Prize in physics was given to John Bardeen, Walter Brattain, and William Shockley for the invention of the first practical transistor.

8.9. Insert *What, Where, Why, When, How.*

1. ___ do you like best? 2. ___ does Mike get up in the morning? 3. ___ don't you go by bus, Max? 4. ___ hobbies does Andrew have? 5. ___ do they go to every week? 6. ___ old is Mike? 7. ___ is Susan's birthday? 8. ___ are my exercise books? 9. ___ do they do during coffee-breaks? 10. ___ do the Robinsons live? 11. ___ is the weather like today? 12. ___ don't you like apple juice? 13. ___ about a walk through the forest? 14. ___ do you play volleyball? 15. ___ is my red sweat-shirt, Mum? 16. ___ did Anne and Joe get to school yesterday? 17. ___ did your grandfather retire? 18. ___ did you hide my umbrella? 19. ___ did he do after the concert? 20. ___ didn't she phone me before the meeting? 21. ___ will you go on weekend? 22. ___ will you cook for breakfast? 23. ___ will he wake up tomorrow?

8.10. Insert question words where necessary.

1. ___ knows the time? – I know. 2. ___ don't you like apple juice? – Because it is sour. 3. ___ do you play volleyball? – Twice a week. 4. ___ do Anne and Betty get to school? – By bus. 5. ___ does your father go to work on foot? – Yes. 6. ___ do you like your coffee? – No, it's too sweet. 7. ___ does your friend work? – In the zoo. 8. ___ comes after Friday? – Saturday. 9. ___ do you go shopping with? – With my wife. 10. ___ does the train arrive in Berlin? – At 5-30. 11. ___ makes you sleepy? – Action films. 12. ___ do you do at work? – I copy documents.

8.11. Compose questions to which the following are the answers.

1. At 5 pm. 2. Not really. 3. Every Tuesday. 4. When I come home. 5. Because I live far from the University. 6. Two o'clock. 7. There aren't any. 8. Yes, always. 9. Unfortunately, not. 10. Behind the door. 11. Fifty seven. 12. Green. 13. Without my friends. 14. By tram. 15. Certainly.

8.12. Follow each pattern to give an example of your own.

1.	She's a high school student, *isn't she?*	16.	Tom won't be late, will he?
2.	She isn't a doctor, is she?	17.	You can speak German, can't you?
3.	You're tired, aren't you?	18.	I shouldn't have lost my temper, should I?
4.	We aren't late, are we?	19.	You have done this before, haven't you?

5.	I am a teacher, aren't I?	20.	Jane, you haven't got a pen, have you?
6.	I am not tall, am I?	21.	Ann's applied for the job, hasn't she?
7.	You come from India, don't you?	22.	He was busy yesterday, wasn't he?
8.	They don't want to come, do they?	23.	He wasn't busy yesterday, was he?
9.	She speaks 3 languages, doesn't she?	24.	They were absent yesterday, weren't they?
10.	Mark doesn't play football, does he?	25.	They weren't at home yesterday, were they?
11.	There are a lot of people here, aren't there?	26.	Listen, will you?
12.	There aren't any apples, are there?	27.	Don't talk, will you?
13.	She came home late yesterday, didn't she?	28.	Nobody wants to study at weekends, do they?
14.	She didn't watch the film last night, did she?	29.	Nobody came, did they?
15.	He will pay the bill, won't he?	30.	Let us go, shall we?

8.13. Insert question tags.

1.	You're Ukrainian, ___?	24.	The working day is from 8 till 16, ___?
2.	You've done a lot of work, ___?	25.	You speak Spanish, ___?
3.	Let's discuss another question, ___?	26.	Give me a copy of your diploma, ___!
4.	I shouldn't worry, ___?	27.	Don't be too upset about it, ___?
5.	You don't have any bad habits, ___?	28.	You couldn't lend me a pen, ___?
6.	There'll be lots to see in Rome, ___?	29.	We can't smoke in the building, ___?
7.	Say something to me in Greek, ___?	30.	You didn't have to wait long, ___?
8.	Your father works in Canada, ___?	31.	You met your husband in Canada, ___?
9.	Help me with these bags, ___?	32.	This photo was taken in London, ___?
10.	You haven't applied to a job yet, ___?	33.	There aren't theatres in this city, ___?
11.	Sit down for a moment, ___?	34.	He wants to quit, ___?
12.	You couldn't help me with my work, ___?	35.	There won't be too many people today, ___?
13.	The office looks really great, ___?	36.	The lift doesn't work, ___?

14.	You haven't got a pet, ___?	37.	I'm on time for the interview, ___?
15.	There isn't any conditioner in the office, ___?	38.	He's got a very peculiar voice, ___?
16.	Oh, shut the door, ___?	39.	This isn't a very busy area, ___?
17.	You haven't got a pen by any chance, ___?	40.	Let's take a break, ___?
18.	You don't like football, ___?	41.	They're having lunch, ___?
19.	You can't drive, ___?	42.	Your company has never employed a student, ___?
20.	It's extremely cold here in the winter, ___?	43.	She's going to have a baby soon, ___?
21.	Let's meet at 8, ___?	44.	These people are really helpful, ___?
22.	They're going to Greece on Saturday, ___?	45.	You'd like to win a fortune on the lottery, ___?
23.	You've been working late again, ___?	46.	I am not late, ___?

9. ТЕПЕРІШНІЙ ПРОСТИЙ ЧАС (PRESENT SIMPLE TENSE)

Випадки вживання	**Приклади**
Загальновідомі факти та істини	The sun rises in the east. – Сонце підіймається на сході.
Повсякденні дії, що повторюються	I wake up at 7.00 every morning. – Я прокидаюсь кожного ранку о сьомій.
В умовних реченнях після ***if*** – якщо, ***in case*** – у випадку, ***when*** – коли	I'll help you if I have time. – Я допоможу тобі, якщо матиму час.

Способи утворення

Стверджувальна форма

I / you / we / they / my friends **work** at the University.

He / she / it / my friend / this computer **works** well.

Питальна форма

Do I / you / we / they / my friends **work** at the University?

Does he / she / it / my friend / this computer **work** well?

Заперечна форма

I / you / we / they / my friends **do not work** at the University.
He / she / it / my friend / this computer **does not work** well.

Запам'ятайте!

Для утворення питальної та заперечної форми для теперішнього та минулого часів групи **Simple** використовується **допоміжне дієслово *do*** (у відповідній особовій формі), яке у питальних реченнях ставиться перед підметом (**зворотний порядок слів**), а у заперечних стоїть перед присудком та супроводжується часткою ***not***.

Допоміжне дієслово є носієм **граматичної інформації**, тобто саме його форма відповідає потрібним **часу, особі та числу**, а основне дієслово залишається у формі **інфінітиву**.

9.1. Put the verbs in brackets in the proper form of Preset Simple.

1. I (to like) roller-skating. 2. My sister (to live) in other city. 3. The telephone network (to extend) worldwide. 4. Some people (not to use) Internet. 5. This car (to cost) a fortune. 6. Magnets (to attract) metals. 7. A minute hand (to make) one revolution every hour. 8. Raindrops (to have) sizes ranging from 0.1 to 9 millimetres. 9. This chocolate bar (not to melt) too fast. 10. Microorganisms (to make) up 80 % of Earth's biomass.

9.2. Write down the negative form of the sentences. Put all possible questions to the sentences. Translate the sentences.

1. She has an old TV-set at home. 2. Most people like animals. 3. Some sharks attack humans and aquatic animals. 4. Water consists of hydrogen and oxygen. 5. This program contains an error. 6. Some animals hibernate during winter. 7. The global surface temperature increases due to greenhouse gases. 8. Storms often occur in the Pacific Ocean. 9. The Internet provides access to vast information. 10. This device significantly improves the computer's performance.

9.3. Put the verbs in brackets in the proper form of Preset Simple.

1. When you (to use) an electric stove, electricity (to run) to a wire inside the coils on the cook top. Smooth top stoves (to have) an internal coil that (to sit) underneath the cooking surface. When you (to turn) the dial on the stove, the electricity (to flow) to

the coil and (to heat) up the metal. You can tell that electricity is flowing to the cook top when it (to turn) a bright orange color. The more you (to turn) the dial, the more electricity (to flow) to the burner and the hotter it (to get) – but the control (not to be) as precise as it (to be) with a gas stove.

2. The bulb thermometer (to be) the common glass thermometer you probably grew up with. The thermometer (to contain) some type of fluid, generally mercury. Bulb thermometers (to rely) on the simple principle that a liquid (to change) its volume relative to its temperature. Liquids (to take) up less space when they (to be) cold and more space when they (to be) warm – this same principle (to work) for gases and (to be) the basis of the hot air balloon as well. All bulb thermometers (to use) a fairly large bulb filled with coloured liquid and a narrow tube that (to go) from the bulb and (to show) the change in liquid volume.

9.4. Fill in the gaps.

1. The majority of Earth's iron ___ in iron ore.

a) exist b) is exist c) exists

2. In a bloomery, the fire ___ hot enough to melt the iron completely.

a) get not b) do not get c) doesn't get

3. Clouds ___ a key part of our planet's hydrologic cycle, in which water continually ___ between the surface and the atmosphere.

a) are, moves b) is, move c) are, move

4. ___ artificial dyes in food ___ people's health?

a) does, affect b) do, affects c) do, affect

5. At what temperature ___ chocolate ___?

a) does, melt b) -, melts c) do, melts

6. What molecule ___ of two atoms of hydrogen and one atom of oxygen?

a) does consist b) consists c) is consist

7. Cesium atomic clocks ___ a beam of cesium atoms. The clock ___ cesium atoms of different energy levels by magnetic field.

a) employs, separate b) employ, separates c) employ, separate

8. Greece ___ the area of about 131 square kilometres.

a) occupies b) occupy c) occupys

9. Luxembourg ___ on Belgium, Germany, and France.

a) is border b) border c) borders

10. Very often engineers ___ their best ideas from nature.

a) borrow b) borrows c) does borrow
11. When ___ the new academic year ___?
a) -, starts b) do, start c) does, start
12. Where ___ bees ___ honey?
a) do, store b) does, stores c) does, store
13. District of Columbia ___ to any separate state.
a) doesn't belong b) do not belong c) not belongs
14. ___ nuclear waste ___ radioactive elements?
a) Do, contain b) Does, contain c) Does, contains
15. How many people ___ in the Antarctic?
a) live b) lives c) do live

10. МИНУЛИЙ ТА МАЙБУТНІЙ ЧАС (THE PAST AND FUTURE INDEFINITE (SIMPLE) TENSE)

The Past Indefinite (Simple) Tense

Випадки вживання	**Приклади**
Дії, що відбувалися у минулому, або факт, що мав місце в минулому (показники минулого часу: *last year, in 1999, yesterday*, etc.)	He got a Bachelor's degree in 2000. – Він отримав диплом бакалавра в 2000 році.

Форма минулого часу для **правильних** дієслів утворюється додаванням закінчення ***-ed*** незалежно від особи та числа.

Форма минулого часу для **неправильних** дієслів утворюється різними способами (див. таблицю неправильних дієслів (Appendix 2) – другий стовпчик).

Допоміжне дієслово, яке використовується для утворення питальних та заперечних речень у **Past Simple**, набуває форми ***did***.

Приклади

He **worked** at this institute a few years ago.
Who **worked** at this institute a few years ago?
Did he **work** at this institute a few years ago?
Where **did** he **work** a few years ago?
When **did** he **work** at this institute?
He **did not work** at this institute a few years ago.

He **wrote** an article last month.
Who **wrote** an article last month?
Did he **write** an article last month?
What **did he write** last month?
When **did he write** an article?
He **did not write** an article last month.

The Future Indefinite (Simple) Tense

will + V

Випадки вживання	**Приклади**
1. Прогнози на майбутнє (tomorrow, in a few days, next week, one day etc.).	In a few years people will travel to space as tourists.
2. Обіцянки на майбутнє	I will walk the dog when the rain stops.
3. Рішення, що приймаються під час розмови. Речення часто починаються *I think, I believe, Maybe, Probably* тощо	What are you doing tonight? – I haven't decided yet. Probably, I will repair my bicycle.

Приклади
I **will work** at this institute in a few years.
Who **will work** at this institute in a few years?
Will I **work** at this institute in a few years?
Where **will** I **work** in a few years?
When **will** I **work** at this institute?
I **will not** (**won't**) **work** at this institute in a few years.

will not = won't

Увага! В сучасній англійській мові для формування майбутнього часу дієслів у першій особі частіше використовується допоміжне слово ***will***, а не ***shall***. Дієслово ***shall*** набуває модального значення *повинен, треба*.

Приклади
Shall I learn this text by heart? – Чи потрібно мені вчити цей текст на пам'ять?
Shall he come as well? – Йому теж треба приходити?

10.1. Define the tense forms of the verbs. Write down the negative and interrogative forms of the sentences.

1. Sam finished high school last year. 2. Now he studies at Materials Science and Engineering Department at MIT. 3. He works hard because he wants to become a researcher. 4. The curriculum involves chemistry, physics, electronics, materials science etc. 5. His father also graduated from MIT. 6. Last month Sam met Susan at the campus. 7. They spend much time together. 8. During the summer holidays Susan will work as an assistant manager. 9. Sam wants to go to Europe on vacation. 10. Sam and Susan will join one of MIT's 35 sport clubs next year.

10.2. Rewrite the text in the Past (Future) Indefinite.

A usual day of a Harvard student ;)

John wakes up in the morning to the sounds of trumpets acknowledging how special he is. As he walks out of his dorm room, he gives a quick wave to the common, Non-Harvard people on the way to class, maybe tossing them some loose change or a piece of advice.

His professor reminds the students at the beginning of class how fantastic he is, then teaches material that everyone in the classroom finds easy. Everyone scores perfectly on all the tests – that's why they are in Harvard.

After classes, John runs into Bill Gates, Natalie Portman, or Mark Zuckerberg around the campus – after all, these celebrated alumni have nothing better to do than spend all their time at the school.

John hangs around with other students in the evening, talking about the things that Harvard students are interested in – differential geometry, Somerset Maugham, postmodern surrealism, computational economics ... The only problem with the conversations is that everyone already knows everything, so there isn't much to discuss.

Later on, just to relax, John grabs his Harvard acceptance letter and heads into Boston. After all, a Harvard acceptance letter gets you into any club or party in Boston and lets you buy alcohol in bars whatever age you are.

At the end of the day, John curls up in his luxurious dorm room that only Harvard can provide, fully appreciating the advantages that Harvard gives him.

10.3. Put *when*-questions to the following sentences. Example: *We found this information in the Internet yesterday. – When did you find this information in the Internet?*

1. His first article on this subject came out twenty years ago. 2. Members of the Second Continental Congress adopted the final draft of the Declaration of Independence on July, 4, 1776. 3. Computer mouse appeared in early 1980s. 4. Ottawa became the capital of Canada in the mid-1800s. 5. William Somerset Maugham wrote his first novel "Liza of Lambeth" in 1897. 6. Stefani Joanne Germanotta (Lady GaGa) entered the New York University's Tisch School of the Arts at the age of seventeen. 7. A British engineer called James Gibb invented table tennis in the late 1880s. 8. Budapest, Hungary, saw the first Rubik's Cube World Championship on June 5, 1982. 9. In the 1630s, Pierre de Fermat formulated his most notorious mathematical problem. 10. After his return from Heidelberg in 1863, Mendeleev taught chemistry at the University of St. Petersburg.

10.4. Open the brackets using the verbs in Present, Past or Future Indefinite.

1. Gauss (to read) one of Lobachevski's paper published in a small booklet in German. He (to be) so much fascinated with it that he (to learn) Russian in order to read all the rest Lobachevski's works. 2. The Earth's crust (to contain) on average 5 percent iron. 3. In 2012 Kharkov (to host) UEFA European Football Championship. 4. NASA says it (to put) astronauts in orbit around Mars in the 2030s. 5. They say, the cosmos (to begin) 13.7 billion years ago with the big bang. 6. Quantum mechanics (to be) a branch of physics that (to study) physical phenomena at microscopic scales, where the action (to be) on the order of the Planck constant. 7. About 1,000 years ago, the climate (to be) warm and the North Atlantic Ocean (not to have) much sea ice in it. 8. We hope that she (to give) a speech at the graduation ceremony. 9. Every year thousands of young people in England (to finish) school and then (to take) a year off before they (to start) to work or (to go) to university. 10. India (to remain) heavily dependent on coal for the next 20 years despite its plans to boost the use of hydro, nuclear, and renewable power. 11. A few hundred years ago people (to believe) in mermaids and giant sea monsters. 12. When Hawaii (to become) a state? 13. Why this job (to interest) you? 14. How many people on average you (to interact) with on a daily basis at your last job? 15. What you (to view) as the most challenging part of this job? 16. I (to contact) you next week and we (to arrange) a meeting to discuss our mutual interests.

10.5. Fill in the gaps.

1. They say that opposites ___.

a) attracted b) attracts c) attracting d) attract

2. Why ___ you ___ your previous job?

a) -, left b) did, leave c) did, left d) do, left

3. Our secretary ___ you in a few days.

a) call b) called c) calls d) will call

4. ___ you ___ to work alone or in a team?

a) Will, prefers b) Do, prefer c) Did, preferred d) Does, prefer

5. He ___ several copies of resume to be on the safe side.

a) written b) writed c) wrote d) write

6. What ___ most important to you in a new position?

a) is b) does c) do d) be

7. In what field ___ you ___ when you graduate?

a) does, work b) will, worked c) -, works d) will, work

8. Before the interview she ___ her answers out loud.

a) will rehearses b) did rehearse c) rehearse d) rehearsed

9. This position ___ communication skills.

a) required b) requires c) require d) do requires

10. Red in fall leaves ___ from a pigment that the leaves make only in the fall – scientists don't know why.

a) came b) come c) comes d) will come

11. Max Plank first ___ the quantum in 1900 in a study of dark matter radiation.

a) introduces b) introduced c) will introduce d) introduce

12. Some of our graduates ___ researchers in a few years.

a) become b) became c) will become d) becomes

13. ___ they ___ industrial training next month?

a) do, have b) does, have c) will, have d) did, have

14. ___they ___ entrance examinations last week?

a) do, pass b) does, pass c) did, pass d) will, pass

15. Nebulae ___ the elements from which stars and solar systems are built.

a) contains b) contain c) containing d) contained

16. Real gases ___ the perfect gas laws.

a) do not obey b) did not obey c) will not obey d) does not obey

17. The discovery and the interpretation of the Cherenkov effect ___ the Nobel Prize for three Russian scientists in 1958.
a) win b) won c) will won d) wins
18. Pierre Curie ___ the effect of temperature on paramagnetism which is now known as Curie's law.
a) discovers b) discover c) discovered d) did discovered
19. The photoelectric effect with visible and ultraviolet light ___ direct evidence for the existence of the photon.
a) provided b) provides c) provide d) will provide
20. ___ social networks ___ your relations with people?
a) do, influence b) does, influence c) will, influences d) did, influence

11. ЧАСИ ГРУПИ CONTINUOUS

to be + Participle I

Participle I (або **Present Participle**) **–** прислівник теперішнього часу, утворюється від основи дієслів за допомогою додавання закінчення ***-ing***. Наприклад: *to write – writing, to translate – translating, to put – putting, to study – studying*.

The Present Continuous Tense

am / is / are + Participle I

Випадки вживання	**Приклади**
1. Дія, яка відбувається в момент розмови (now – зараз, at this moment, currently – у цей момент, в цей час).	He is sleeping now. – Він зараз спить.
2. Дія, яка відбувається в поточний період часу чи тимчасово (this week – цього тижня, this month – цього місяця).	We are studying English tenses this term. – Ми вивчаємо англійські часи у цьому семестрі.
3. Дія, яка означає постійні зміни (constantly – постійно)	The prices are constantly growing. – Ціни постійно ростуть.
4. Дія, яка планується на майбутнє.	I am leaving tonight. – Я вирушаю сьогодні ввечері.

Приклади

I am writing.	He is translating.	They are studying.
I am not writing.	He isn't translating.	They aren't studying.
Am I writing?	Is he translating?	Are they studying?

Слова, які, як правило, не вживаються у Continuous

Деякі дієслова позначають не дії, а **стан** об'єкта (так звані статичні дієслова), тому вони не вживаються у формах **Continuous**. Їх можна умовно поділити на групи:

Стан об'єкта, відношення між об'єктами	**Емоційний стан, бажання**	**Відчуття**	**Розумова діяльність**
to be	to like	to see	to know
to have	to love	to hear	to understand
to consist (of)	to hate	to feel	to believe
to belong	to fear	to smell	to forget
to include	to envy		to agree
to depend (on)	to want		to doubt
	to need		to think (вважати)

Приклади

We **have** an English lesson now.

The picture is too small. I **need** a magnifying glass to see it.

He is speaking too fast. I **don't understand** him.

Конструкція *to be going to + V*

am / is / are / was / were / will be + going to + V

Випадки вживання	**Приклади**
1. Запланована дія в майбутньому (вживається паралельно з Present Continuous).	He is going to make a report on Friday. = He is making a report on Friday – Він збирається робити доповідь у п'ятницю.

Випадки вживання	Приклади
2. Дія, яка відбудеться в майбутньому з великою вірогідністю, ознаки якої є наявними.	He is studying hard. He is going to pass his exam well. – Він старанно вчиться. Він напевно здасть екзамен добре.

Приклади

It's going to rain. It isn't going to rain. Is it going to rain?

The Past and Future Continuous Tenses

The Past Continuous Tense

was / were + Participle I

Випадки вживання	Приклади
1. Тривала дія, яка відбувається в деякий момент часу в минулому (at 5 o'clock yesterday – о п'ятій годині вчора; at this time yesterday – в цей час вчора).	At this time yesterday I was watching TV. – В цей час вчора я дивився телевізор.
2. Тривала дія, яка відбувається одночасно з деякою дією в минулому (when I came – коли я прийшов).	When I came home my family was having dinner. – Коли я прийшов додому, моя сім'я обідала.
3. Тривала дія, яка відбувається протягом деякого періоду часу в минулому (from 6 till 7 yesterday – вчора з шостої до сьомої; the whole day yesterday – цілий день вчора).	We were preparing for the test the whole last week. – Весь минулий тиждень ми готувались до тесту.

Приклади

I was writing.	He was translating.	We were studying.
I was not writing.	He wasn't translating.	We weren't studying.
Was I writing?	Was he translating?	Were we studying?

The Future Continuous Tense

will be + Participle I

Випадки вживання	**Приклади**
1. Тривала дія, яка відбувається в деякий момент часу в майбутньому (at 5 o'clock tomorrow – о п'ятій годині завтра; at this time tomorrow – в цей час завтра).	At this time tomorrow we will be walking in the park. – В цей час завтра ми будемо гуляти в парку.
2. Тривала дія, яка буде відбуватися одночасно з деякою дією в майбутньому (when you come – коли ви прийдете).	When you come tomorrow we will be still working. – Коли ви прийдете, ми все ще будемо працювати.
3. Тривала дія, яка буде відбуватися протягом деякого періоду часу в майбутньому (from 6 till 7 tomorrow – завтра з шостої до сьомої; the whole evening tomorrow – цілий вечір завтра).	I think we will be discussing this problem for a long time. – Я гадаю, ми будемо обговорювати цю проблему довгий час.

Приклади

I will be writing.	He will be translating.	We will be studying.
I will not be writing.	He won't be translating.	We won't be studying.
Will I be writing?	Will he be translating?	Will we be studying?

11.1. Put down the negative and interrogative forms of the sentences.

1. We are discussing our plans for the weekend at the moment. 2. This year the plant is renovating its facilities. 3. I am copying files from my flash-card now. 4. The cars are accelerating on the speed-way. 5. The substance is dissolving in the solution. 6. These designers are participating in the exhibition next month.

11.2. Rewrite the sentences in Present Continuous. If necessary, change the modifiers of time. Example: *I often walk in the park. – I am walking in the park now.*

1. The printer *sometimes* jams the paper. 2. This alloy oxidizes quickly. 3. The door closes *automatically*. 4. These machine-tools operate unattended. 5. I *often* look for

the information on new computer technologies in the Internet. 6. My colleagues *usually* heatedly discuss scientific issues. 7. The deposited layer grows on the metal surface *slowly*. 8. The pressure in the chamber rises *with heating*. 9. The valve controls the flow of gas into a vacuum system. 10. Oil condenses on the pump walls. 11. Gas property gauges measure conductivity and viscosity. 12. The company delivers the appliances to its customers *regularly*.

11.3. Put down one more sentence to continue the idea of the previous one. Use the structure *to be going to + V*. Example: *He has collected a good deal of experimental data. – He is going to publish the results.*

1. My friend has bought wall paper, paints, brushes etc. 2. Huge clouds are gathering. 3. I am afraid of this dog. 4. Jane is unhappy that she has put on some weight. 5. My car has run out of fuel. 6. Steve has just graduated from Harvard. 7. The sun is setting. 8. It is terribly noisy in this room. 9. I am very thirsty. 10. My computer is hanging.

11.4. Put the verbs in brackets either in Present Indefinite or Present Continuous.

1. When you (to take) one step, you (to use) up to 200 muscles. 2. A light bulb that hasn't been turned off since 1901 still (to shine) at a fire station in Livermore, California. 3. Butterflies (to taste) with their hind feet, which (to allow) them to tell whether a leaf is edible. 4. Currently astronomers (to observe) a cloud of gas that will get eaten by the black hole in the center of our galaxy 27,000 light-years away. 5. At the equator the Earth (to spin) at almost 1,000 miles per hour. 6. Camels (to have) three eyelids – two with lashes – to protect themselves from blowing sand. 7. New York and London (to move) apart about two centimeters a year. 8. These days engineers at MIT (to design) a portable device that users can point at walls to get data on anything moving on the other side. 9. A high-school student from Los Alamos (to construct) a portable, solar-powered desalination unit that (to use) readily available materials: sand, charcoal, and plastic bottles. 10. Fall leaves (to change) color because the green chlorophyll in them (to disappear) as the tree (to prepare) for winter, revealing the yellows and reds usually masked by green. 11. Now materials scientists (to try) to improve the storage capacity, charging / discharging speed, and safety of Li-ion batteries. 12. One of these days a research team in Washington state (to launch) a fusion rocket that could carry people to Mars. 13. Iceland nation (to heat) 87 percent of its homes using geothermal energy. 14. Today scientists (to work) to build a mass-

producible, artificial nose that (to detect) explosives as well as a canine's. 15. The new world's lightest material (to be) a micro-lattice in structure, with the 0.01 percent of the material that (to be) solid, and (to consist) of hollow tubes that (to be) only 100 nanometers thick.

11.5. Fill in the gaps.

1. Astronauts who ___ more than a month in space ___ problems with their eyes.
a) spends, develops b) is spending, develop c) spend, developing d) spend, develop
2. Corn fields that ___ insecticides clothianidin and thiamethoxam ___ to the collapse of bee colonies.
a) use, are contributing b) used, contributes c) uses, is contributing d) use, contributing
3. Electric motors ___ better acceleration than combustible engines.
a) are having b) is having c) have d) has
4. Even though the Voyager-1 spacecraft ___ at 10 miles per second through space, still it ___ it 70,000 years to reach the nearest star.
a) travels, takes b) traveling, take c) is traveling, will take d) travel, take
5. Every year at the World Cell Race, scientists ___ biological cells in Petri dishes.
a) are racing b) race c) races d) racing
6. Future computers ___ on DNA.
a) run b) will run c) are running d) is running
7. Human baby cries ___ nearly identical in structure to lion and tiger roars, which ___ simply at a lower pitch.
a) are, are b) is, are c) be, being d) are, is
8. In 1994, a 17-year-old Michigan Boy Scout ___ a nuclear reactor in his mother's shed using radium from old clocks.
a) built b) builds c) is building d) will build
9. When you ___ in the reception area of your dentist's office, you often ___ some terrifying sounds from behind the door.
a) sit, hear b) are sitting, hear c) sat, hears d) sit, are hearing
10. In the human body, bacteria ___ human cells 10 to 1.
a) outnumbers b) is outnumbering c) are outnumbering d) outnumber
11. It ___ radio broadcasters 38 years to reach an audience of 50 million, television 13 years, and the Internet just four years.
a) takes b) is taking c) took d) will take

12. Mars rover “Curiosity” ___ spare drill bits in case its robotic drill ___ a fresh one.
a) carries, needs b) is carrying, needs c) is carrying, is needing d) carrying, need
13. ICQ ___ actually a pseudo-acronym that ___ for “I Seek You!”
a) is, stands b) be, stand c) are, is standing d) being, standing
14. Thanksgiving ___ a national holiday until 1863, when Abraham Lincoln ___ it for the last Thursday in November.
a) not became, set b) does not become, sets c) didn’t become, set d) didn’t became, set
15. Nearly 90 percent of Americans ___ turkey on Thanksgiving Day.
a) eat b) eats c) are eating d) is eating
16. Leonardo da Vinci ___ plans for a humanoid robot in the 15th Century.
a) sketched b) sketches c) is sketching d) sketching
17. The use of personal mobile devices ___.
a) constantly grows b) is constantly growing c) is constantly grow d) are constantly growing
18. Look out! You ___ down in a pit.
a) are falling b) fell c) fall d) are going to fall
19. Nikola Tesla ___ a radio-controlled robot-boat in 1898.
a) will patent b) patents c) patent d) patented
20. Mercury’s deepest craters probably ___ water ice.
a) is containing b) is contain c) contains d) contain

11.6. Rewrite the sentences in Past and Future Continuous. Change or add the modifiers of time.

1. I am hammering nails into the wall. 2. He is grinding coffee beans. 3. What are you doing now? 4. He is not carrying out the experiment. 5. Who are you waiting for? I am waiting for the dean. 6. She is not listening to the lecturer. 7. They are assembling a unit.

11.7. Choose one of the verb forms: either Past Indefinite or Past Continuous.

1. When the car *accelerated / was accelerating*, one of the tires got punctured. 2. I *called / was calling* him several times but he, probably, *slept / was sleeping* heavily and *didn’t hear / wasn’t hearing* the ring. 3. When Jim *entered / was entering* the hall, the lecturer *showed / was showing* the last slide of his presentation. 4. Last week we *had / were having* a seminar on physics. Instead of solving problems we *discussed / were discussing* the discovery of a new super-hard material. 5. When the students

examined / were examining the solution under a microscope they *noticed / were noticing* some impurities. 6. The countries *tried / were trying* to reach the agreement for years. At last they managed to do that. 7. While I *downloaded / was downloading* the movie on my computer, it suddenly *hang / was hanging* up. 8. There was no more rain but the cold wind *still blew / was still blowing*. 9. When I *turned / was turning* on the TV, there was a talk show on. Five people *talked / were talking* simultaneously and in high words! 10. He *started / was starting* his business from scratch. But he *always moved / was always moving* ahead and finally *became / was becoming* one of the most influential people in the industry.

11.8. Put the verbs in brackets in the proper form: either Past Indefinite or Past Continuous.

1. When Columbus (to start) his voyage to America, he in fact (to look for) the shorter way to the East. 2. During the whole last week they (to make) vain attempts to revive their hard disk. 3. There (to be) lots of people in the streets cheering and singing: they (to celebrate) the city's anniversary. 4. The rain (to pour) day and night. 5. Last month the company (to report) that it (to assemble) a team for improvement of its speech recognition technology. 6. Henry Ford's Motor Company (to produce) its Model T vehicle from 1908 till 1927. 7. During their expedition to the South Pole in 1911 Amundsen and his team (to use) skis and dog sleds for transportation. 8. In April 1912, when the Titanic (to cross) the Atlantic, it (to strike) an iceberg and (to sink). 9. While Pierre and Marie Curie (to experiment) with uranium-containing ore, they (to discover) two new radioactive elements which they (to name) polonium and radium. 10. On December 26, 2004, the tsunami (to hit) different locations at different times. The gigantic wave (to travel) at up to 800 kilometres per hour. 11. When the engineers (to design) the Mars Climate Orbiter, they (to make) a calculation error which then (to cause) the failure of the mission. 12. Thousands of people from over the world (to watch) the total solar eclipse in northern Australia on November, 13, 2012. 13. In 1908, Rutherford (to receive) a Nobel Prize in chemistry, but at that time he (to investigate) already the properties of alpha particles with the help of his 15 research students. 14. At the time when lots of scientists all over the world (to try) to decipher the DNA code, Marshall W. Nirenberg and his colleagues of the National Institutes of Health, near Washington D.C., (to figure out) how to read the genetic information hidden in the DNA strand. It (to happen) in 1961. 15. They say, Archimedes (to formulate) his famous law when he (to take) a bath.

11.9. Write down 5 sentences answering the question: *What things will you be doing in 10 years?* Start your sentences with *I hope ... I think ... I'm confident ... I expect ... I doubt ...* Example: I hope in 10 years I will be living in my own house.

11.10. Fill in the gaps.

1. Abebe Bikila ___ the first black African to win an Olympic gold medal in 1960 in the Marathon. By the way, he ___ all 40 kilometres barefoot.

a) became, ran b) was becoming, runs c) becomes, running d) became, was running

2. Space station astronauts ___ 16 sunrises and 16 sunsets every day.

a) sees b) is seeing c) see d) saw

3. At the time when Steve Jobs and Steve Wozniak ____ their first Apple computer, Wozniak (still) ___ at Hewlett Packard.

a) were presenting, worked b) present, work c) presented, was working d) presented, worked

4. According to an Irish legend, on judgment day Christ ___ all nations, but St. Patrick ___ the Irish.

a) will be judging, will be judging b) will judging, will judging c) is judging, is judging d) was judging, was judging

5. The first Mars rover mission failed. The rover ___ data to the Earth when a storm ___ it over.

a) transmits, blows b) was transmitting, blew c) transmitted, blew d) was transmits, blow

6. Most likely, the first moon colonists ___ in lunar caves.

a) lived b) will lives c) will be living d) will living

7. The first synthetic dye ___ the color mauve, created when chemist William Perkin ___ to find a cure for malaria.

a) were, tried b) is, was try c) was, tried d) was, was trying

8. The Mayan Long Count Calendar ___ doomsday.

a) didn't foretell b) not foretold c) didn't foretold d) no foretell

9. The world's first solar-powered ski lift ___ in 2012 in Switzerland.

a) was opening b) opens c) opening d) opened

10. When the plane ___ along the landing strip, the passengers ___ a sudden jolt.

a) was running, felt b) ran, felt c) ran, were feeling d) runs, feel

11. Not so long ago astronomers noticed that the famous North Star (Polaris) ___.

a) shrink b) was shrinking c) shrinks d) shrank

12. There were no flying dinosaurs or swimming dinosaurs. All dinosaurs ___ on land.
a) was living b) lived c) were living d) will be living
13. Super-fast maglev trains ___ on a cushion of air that is just 1/3 of an inch thick, using the repelling forces of magnets.
a) run b) runs c) is running d) are running
14. The first sound record was made in 1860: a woman ___ Claire de Lune.
a) is singing b) sing c) sang d) was singing
15. A new plastic coating ___ just like skin, turning red and bleeding when scratched.
a) behaving b) is behaving c) behave d) behaves
16. As Beethoven ____ more deaf with every coming year, in his compositions he ___ lower-frequency notes that were easier for him to hear.
a) became, choosing b) was becoming, chose c) became, chose d) becoming, choosing
17. In 1923 Walt and Roy Disney were almost unknown. At that time they ___ only their first cartoons in a Hollywood garage.
a) made b) were making c) was making d) make
18. Germany ___ several new wind farms in the nearest future.
a) launched b) launches c) will launch d) is going to launch
19. Archimedes was killed when the city of Syracuse, where he ___, ___ against Romans.
a) lives, fights b) was living, fought c) lived, was fighting d) lived, fought
20. The koala ___ liquids. The leaves they eat ___ a good source of water.
a) does not drink, are b) do not drink, are c) are not drinking, is d) not drinks, be

12. ЧАСИ ГРУПИ PERFECT

to have + Participle II основного дієслова

Participle II утворюється за допомогою закінчення ***-ed*** для правильних дієслів і має спеціальну форму для неправильних дієслів (дивись таблицю неправильних дієслів (Appendix 2) – третій стовпчик)

The Present Perfect

***have / has* + Participle II**

Випадки вживання	**Приклади**
1. Завершена дія, точний час якої не вказується, а більше уваги приділяється результату.	I have left my textbook at home. – Я залишив свій підручник вдома.
2. Дія, яка закінчилась до моменту розмови, а час дії позначений невизначеними дієприслівниками: *already – вже*, *yet – ще* (у заперечних реченнях) та *вже* (у питальних реченнях), *just – щойно*, *recently – нещодавно*, *ever – коли-небудь* (у питальних реченнях), *never – ніколи*.	He has already come. – Він вже прийшов. Have you ever been to France? – Ви коли-небудь були у Франції? She hasn't yet returned. – Вона ще не повернулась. Have you bought this book yet? – Ви вже купили цю книгу?
3. Дія, яка завершилась в поточний інтервал часу (*this week* – цього тижня, *this month* – цього місяця).	We have passed two exams this week. – Цього тижня ми склали два екзамени.

Приклади

I have written.	He has translated.	We have studied.
I have not written.	He hasn't translated.	We haven't studied.
Have I written?	Has he translated?	Have we studied?

The Past Perfect Tense (Минулий перфектний час)

***had* + Participle II** основного дієслова

Випадки вживання	**Приклади**
1. Дія, яка закінчилась до деякого моменту у минулому (by 5 o'clock yesterday – до 5 години вчора).	He had finished his work by 6 o'clock in the evening. – Він закінчив роботу до 6 години вечора.
2. Дія, яка закінчилась до іншої дії у минулому (before he came – до того, як він прийшов).	Before he came, we had already planted all the trees. – До того, як він прийшов, ми вже посадили всі дерева.

Приклади

I had written.	He had translated.	We had studied.
I had not written.	He hadn't translated.	We hadn't studied.
Had I written?	Had he translated? Had we studied?	

The Future Perfect Tense (Майбутній перфектний час)

***will have* + Participle II** основного дієслова

Випадки вживання	**Приклади**
1. Дія, яка закінчиться до деякого моменту у майбутньому (by 5 o'clock tomorrow – до 5 години завтра).	He will have finished his work by 6 o'clock tomorrow. – Він закінчить роботу до 6 години завтра.
2. Дія, закінчиться до деякого моменту у майбутньому, який виражений іншою дією (before he comes – до того, як він прийде).	Before he comes, we will have already planted all the trees. – До того, як він прийде, ми вже посадимо всі дерева.

Приклади

I will have written.	He will have translated.	We will have studied.
I will not have written.	He won't have translated.	We won't have studied.
Will I have written?	Will he have translated?	Will we have studied?

12.1. Put the sentences into negative and interrogative forms.

1. I have just called him to his office. 2. The rain has already stopped. 3. She has broken three beakers today. 4. The experiments have proved his idea. 5. He has always dreamt of such a device. 6. This month the scientists have obtained new data. 7. The antivirus program has already scanned my computer. 8. The company has recently launched a new production line.

12.2. Choose one of the modifiers and put it into the proper place. Write down the same sentences with the other modifier.

1. The snow has melted. (a month ago, already) 2. My friend graduated from the University. (two years ago, recently) 3. Have you been to Germany? (ever, before the unification) 4. Jim made these photos. (this week, last week) 5. Anna hasn't shown me her new iPad. (yet, yesterday) 6. Have you reserved a room in the hotel? (already,

yet) 7. The train left. (a moment ago, just) 8. We have learned many new things. (this year, last year) 9. Nick has called from the airport. (in the morning, just) 10. I was at this museum. (twice, in 2005)

12.3. Complete the sentences using Past Indefinite or Present Perfect.

1. ___ last December. Now she is jobless. 2. ___ but she is not tired at all. 3. Yesterday ___ but today I am absolutely free. 4. ___ three times. I don't want to see it again. 5. ___ in winter, and now when it's spring I go roller-skating every day. 6. ___ this month but he still has much work to do to finish his repair work. 7. It's a pity ____. You should try it again. 8. ___ yet? If not, I may help you to finish it. 9. ___ at school, but he doesn't want to continue his education. 10. I haven't seen him lately. When ___ last time?

12.4. Use the proper form of the verb in brackets: either Present Perfect or Past Indefinite.

1. Google's fleet of robotic Toyota Priuses (to drive) more than 190,000 miles without a driver. 2. Gandhi (to cover) the 1932 Olympic games in Los Angeles as a reporter. 3. Pucks hit by hockey sticks (to reach) speeds of up to 150 miles per hour. 4. In 1988, Yannis Kouros (to run) 1,000 miles in 10 days, 10 hours, 30 minutes and 35 seconds, breaking the world record by over 34 hours. 5. Leonardo da Vinci (to conceptualize) helicopters, parachutes, weapons of war and designer handbags. 6. Three continents – Africa, South America, and Antarctica – never (to host) an Olympics. 7. The Hubble Space Telescope (to carry) out over a million scientific observations and is adding more all the time. 8. Nearly 80 percent of land-dwelling species (to disappear) 252 million years ago. 9. The Japanese beer company Sapporo (to brew) beer from barley grown on the space station. 10. Walt Disney, the creator of Mickey Mouse, (to be) afraid of mice. 11. T. rex teens (to grow) as fast as 3,950 pounds per year. 12. The venom of the box jellyfish is among the most powerful in the world. It (to cause) at least 5,567 human deaths since 1954. 13. The ancestor of all modern horses (to live) about 140,000 years ago. 14. Less ice in the Arctic (to make) it possible to install three new cross-polar Internet cables. 15. The great-great-grandfather of Barack Obama (to come) from Moneygall, County Offaly in Ireland. 16. The largest recorded tsunami was a wave 1,720 feet tall – over a quarter mile high. It (to strike) Lituya Bay, Alaska, in 1958. 17. Military tech firm Chamtech (to invent) a way to spray thousands of nanocapacitors onto any surface, creating spray-

on Wi-Fi. 18. No one (to receive) more U.S. patents than Thomas Edison: 1,093. 19. One third of the world's population never (to make) a telephone call.

12.5. Fill in the gaps.

1. A typical asteroid, like Eros, ___ $20 trillion in rare minerals.
a) is containing b) contain c) has contained d) contains
2. Bill Gates ___ the fourth-richest man in American history.
a) becomes b) has become c) became d) is becoming
3. Bubblegum is usually pink because its inventor, Walter Diemer, ___ only pink food coloring at his factory.
a) had b) have c) has d) is having
4. Voyager 1 was launched in 1977. It ___ and it ___ the first man-made object to leave the solar system.
a) still moves, is b) has still moved, was c) is still moving, will be d) still moved, was
5. On November 30, 1954, a large meteorite ___ through the roof of Ann Hodges' Alabama house and ___ her hip. It ___ the first recorded instance of a meteorite hitting a person.
a) crash, bruise, is b) crashed, bruised, was c) crashes, bruises, will be d) has crashed, has bruised, has been
6. An ozone hole ___ over the Arctic.
a) has recently appeared b) recently appeared c) recently appears d) is recently appearing
7. The cesium atom in an atomic clock ___ 9,192,631,770 times a second.
a) pulsed b) has pulsed c) is pulsing d) pulses
8. The fastest car on the planet in 1898 ___ the land-speed record with a blistering 39.24 miles per hour.
a) was braking b) brakes c) broke d) has broken
9. Scientists ___ the existence of water on the Moon.
a) have proved b) proved c) prove d) has proved
10. Giant amoebas called xenophyophores ___ in the ocean 6.6 miles down, in the Mariana Trench.
a) have lived b) is living c) lives d) live
11. If you ___ this, then, probably, you ___ about giant amoebas in the Mariana Trench.
a) have read, are learning b) are reading, have learnt c) read, learn d) reads, has learnt

12. How many years ___ since you ___ the University?
a) have passed, entered b) pass, enter c) passed, entered d) passed, have entered
13. When ___ the University?
a) had you enter b) did you entered c) have you entered d) did you enter
14. The researchers at Rice University ___ a tiny silicon oxide switch last year.
a) have invented b) invented c) has invented d) invent
15. The constructors ___ the crane.
a) haven't yet assembled b) didn't yet assembled c) didn't yet assemble d) not assembled
16. Scientists ___ an exoplanet so massive they're not even sure it's a planet at all.
a) discovered b) has discovered c) have discovered d) are discovering
17. The students ___ two substances and then ___ the measurements again.
a) mix, take b) mixed, took c) have mixed, have taken d) have mixed, took
18. On July 16, 1969, the Apollo 11 spacecraft ___ Earth at 9:32 in the morning.
a) left b) leave c) leaves d) has left
19. Over the past three years, CERN ___ protons together more than six million billion times.
a) have collided b) has collided c) collided d) are colliding
20. Ancient people living in the Arctic Circle ___ the sledge as early as 7,000 years ago to carry their belongings.
a) have invented b) invented c) has invented d) did invent

12.6. Write one more sentence in each situation to say that the action had been completed by the definite time. Example: *Tom was writing a letter. – He had written the letter by 10 o'clock.*

1. Jane was cooking the dinner. 2. Ann was knitting a sweater the whole month. 3. The microbiologist was examining a new virus for a long time. 4. The mechanic was repairing my car. 5. The leaves were falling from the trees. 6. Street-cleaners were breaking the ice on the street. 7. My sister was buying presents for Christmas. 8. The cat was catching mice. 9. The judges were choosing the most talented dancer. 10. The students were drawing charts. 11. My group-mates were learning Ohm's law. 12. My friend was sending invitations to the conference. 13. The liquid was freezing slowly. 14. The temperature was rising.

12.7. Make a list of 5 interesting things you had done by the age of 20. Ask other students about their experience. Example: ***By the age of 20 I had visited Australia. What countries had you visited by the age of 20?***

12.8. Use your imagination to give the background of the following events. Example: ***The engine-driver stopped the train ... because somebody had put a big stone on the rails.***

1. My favourite sportsman failed at the competition. 2. The house burnt quickly. 3. The child burst into tears. 4. My friend was happy. 5. The solution became cloudy. 6. The company ordered new equipment. 7. My computer hung. 8. I was late for my classes. 9. The tire became flat. 10. I had to rewrite the whole chapter of my diploma work.

12.9. Translate into English.

1. До того як люди винайшли електрику, вони писали при свічках. 2. До 20 століття населення землі досягло приблизно 1,5 мільярди. 3. До початку експериментів вчені ретельно перевірили апаратуру. 4. Коли мій друг розібрав комп'ютер, він побачив, що один з дротів від'єднався. 5. До кінця семестру ми напишемо диплом. 6. Він почав грати в шахи ще до того, як навчився читати. 7. Я дізнався, що Пітер Хіггс отримав Нобелівську премію за відкриття у галузі фізики елементарних частинок. 8. До того часу як студенти повернуться з канікул, будівельники відремонтують гуртожиток. 9. В Єгипті археологи знайшли шматочок метеорита, який впав на землю мільйони років тому. 10. Вчора я зустрів товариша, якого я не бачив вже 10 років.

12.10. Fill in the gaps.

1. Some species of animals ___ before the ice age ___.

a) had died off, had begun b) died off, began c) died off, had begun d) had died off, began

2. Scientists predict that the Earth climate ___ by 2050s.

a) will change b) will have changed c) changes d) will be changing

3. Newspapers report that a yet unknown virus ___ most computers in the country.

a) has infected b) have infected c) had infected d) will have infected

4. Scientists warn that some animal species are endangered because Polar ice caps ___.

a) melt b) have melted c) are melting d) had melted
5. By the time the fire brigade ___ the house ___ to ashes.
a) arrived, burnt b) arrived, had burnt c) had arrived, burnt d) arrives, burnt
6. The police ___ any convincing evidence of his words yet.
a) hadn't obtained b) didn't obtained c) haven't obtained d) doesn't obtain
7. In 1993 Andrew Wiles ___ that he ___ Fermat's Last Theorem.
a) stated, had proved b) stated, proved c) had stated, proved d) states, was proving
8. The participants of the conference ___ the abstracts of their reports by the deadline.
a) will submitted b) will have submitted c) will submit d) will submitting
9. In August 2012, Mars rover Curiosity ___ the first pictures from the Red Planet.
a) sent b) had sent c) has sent d) sends
10. More than 200,000 people ___ for a one-way trip to Mars.
a) has signed up b) have signed up c) had signed up d) signed up
11. Experts predict that by the middle of the century computer hardware ___ the human brain.
a) will matched b) will match c) had matched d) will have matched
12. Our body ___ numerous forms of immune defense.
a) has b) have c) has had d) had had
13. All the passengers ___ the drowning ship before it disappeared under the waves.
a) were leaving b) left c) had left d) have left
14. Over the past eight years the use of social networks ___ by 800%.
a) had increased b) increased c) is increasing d) has increased
15. Thirty-five percent of school students in the US ___ iPhones.
a) uses b) are using c) have used d) will use
16. The world's 9.9 billion acres of forest ___ roughly a quarter of human emissions of carbon dioxide.
a) absorb b) absorbs c) has absorbed d) will absorb
17. Humankind ___ more aluminum, copper, iron and steel, coal, oil, natural gas, and even sand and gravel over the past century than over all earlier centuries put together.
a) consumed b) consumes c) is consuming d) has consumed
18. The plant ___ its full capacity by the end of the year.
a) will have reached b) will be reach c) will reach d) will be reaching
19. In the last 35 years, energy consumption ___ from 21 to almost 13 kilowatt-hours per kilogram of aluminum produced.
a) fell b) has fallen c) fallen d) had fallen

20. It is expected that the Jupiter-bound spacecraft Juno, which was launched in 2011, ___ to its target by 2016.
a) arrives b) will arrive c) will have arrived d) arrived

13. ЧАСИ ГРУПИ PERFECT CONTINUOUS

to have + been + Participle I основного дієслова

The Present Perfect Continuous

***has / have* + *been* + Participle I**

Випадки вживання	**Приклади**
Незавершена дія, яка почалась у минулому і триває дотепер, або тільки-но закінчилась. Зазвичай вказується інтервал часу, протягом якого виконується дія (since – з; for – протягом).	I have been studying English for 3 years (since my childhood). – Я вивчаю англійську протягом трьох років (з дитинства).

Приклади
I have been writing. He has been translating. They have been studying.
I have not been writing. He hasn't been translating. They haven't been studying.
Have I been writing? Has he been translating? Have they been studying?

The Past Perfect Continuous

***had* + *been* + Participle I**

Випадки вживання	**Приклади**
Незавершена дія, яка почалась у минулому і триває до певного часу у минулому. Зазвичай вказується інтервал часу, протягом якого виконується дія (since – з; for – протягом).	He had been writing the letter for half an hour before I came. – Він писав листа вже півгодини, до того як я прийшов.

Приклади
I had been writing. He had been translating.

I had not been writing. He hadn't been translating.
Had I been writing? Had he been translating?

The Future Perfect Continuous

***will have* + *been* + Participle I**

Випадки вживання	**Приклади**
Дія, яка триває зараз і буде продовжуватись до деякого моменту у майбутньому (since – з; for – протягом).	Tomorrow he will have been travelling for a year. – Завтра виповнюється рівно рік, як він подорожує.

Приклади
I will have been writing. He will have been translating.
I will not have been writing. He will not have been translating.
Will I have been writing? Will he have been translating?

Запам'ятайте! Слова, які не вживаються у Continuous (статичні дієслова), також не вживаються у Perfect Continuous. Наприклад**:** I haven't seen you for ages. – Я не бачив тебе сто років. He has known me since my childhood. – Він знає мене з дитинства.

13.1. Put the sentences into negative and interrogative forms.
1. The weather is fine today; the sun has been shining ever since we got up. 2. I have already been looking for my mobile phone for fifteen minutes. 3. My son has been studying Spanish since his childhood. 4. Our University has been cooperating with foreign countries for decades. 5. They have been playing in this team for three years.

13.2. Put the questions "How long ...?" to the following sentences.
1. The Hubble Space Telescope has been operating in low Earth orbit since 1990. 2. Since 2008 the scientists at LHC have been observing the results of elementary particle collisions. 3. Pirates have been roaming the seas for almost as long as there have been ships. 4. Man has been using wind power since 3000 B.C. 5. For many years Apple and Google have been struggling to win the hearts and minds of people across the planet. 6. Historical evidence suggests that Koalas have been living on earth for about 50 million years. 7. The world's space agencies have been seeking

ways to reduce the growth of orbital debris for years. 8. Scientists have been constructing a model of the Sun for many years. 9. Twitter website has been operating since 2006. 10. The Texas Heart Institute has been developing heart assist devices since mid-1970s.

13.3. Give your reasoning to the following statements using Present Perfect Continuous. Example: *I am too tired. – I have been walking for the whole day.*

1. They have bought a new car. 2. There is so much snow in the street. 3. The old kettle is shining again. 4. His English is perfect. 5. She looks rather sportive. 6. The old equipment has been replaced. 7. My friend is a big expert in computers. 8. Peter has made a decision at last. 9. You have so many unique books. 10. The researchers have finally found the reason for this mysterious phenomenon.

13.4. Use either Present Perfect or Present Perfect Continuous of the verbs in brackets.

1. He (to look) for job for half a year. 2. This program (to run) since the morning. 3. We (not to hear) from him for several months. 4. Kharkov Tractor Plant (to produce) tractors since 1931. 5. I (to wait) for news from him for a few days already. 6. I always (to know) that he can't be trusted. 7. He (to have) lunch for an hour already. 8. The dean (to be) in his office since the morning. 9. My friend (to have) this talent since early childhood. 10. This lighthouse (to belong) to his family for many centuries.

13.5. Translate into English using Perfect Continuous Tenses.

1. До того як приїхала пожежна бригада, двоє хлопців пів години гасили пожежу самі. 2. Ще п'ять хвилин – і буде вже година, як я її чекаю. 3. Моя сестра з ранку ходить по крамницях. 4. Вони вже довго шукали вихід з цієї складної ситуації, коли несподівано йому спала на думку блискуча ідея. 5. Чому ти так важко дихаєш? – Я всю дорогу біг, щоб найскоріше повідомити вам цю новину. 6. Коли я вийшов з дому, пішов дощ і я вимок до нитки. А я так довго прасував свої брюки! 7. Космічний корабель Voyager 1 мандрує в космосі вже 36 років. 8. Через місяць виповнюється рівно 50 років, як він працює в нашому університеті. 9. Компанія Форд використовує конвеєр для збирання автомобілів з 1913 року. 10. До того як Філіп вступив до університету, він 3 роки працював касиром у банку.

13.6. Put the verbs in brackets in the proper form.

1. It (to take) me a lot of time to get there last week. 2. Who just (to ring) you up? 3. He usually (to leave) home for the University at 8 o'clock. 4. How long her brother (to learn) French? 5. I (to write) a letter to my friend for half an hour. 6. Our football team (to play) since 2 p.m. 7. They (to work) at this University for five years before they decided to move to another city. 8. He (to do) his homework since he returned from school. 9. Nick always (to tell) funny stories. 10. She (to wash) the floor in her room at the moment. 11. Who usually (to help) passengers to pull their luggage to carriages? 12. In two days the scientists (to test) the device for a month already. 13. The hexagonal crystal structure (to make) graphene flexibility, strength and high stability. 14. Next summer they (to invite) their cousin to stay with them. 15. We (to solve) this difficult problem for an hour or so. 16. The discovery of radioactivity near the end of 19-th century (to start) the modern era of the study of atoms. 17. An electric generator (to use) the principle of induced voltage and current to supply electric power. 18. My father (to know) this famous scientist since he graduated from the University. 19. In future graphene (to change) the size and type of most electronic devices. 20. Tomorrow I (to be) busy studying this method for a fortnight.

14. ПОВТОРЕННЯ ЧАСІВ ACTIVE VOICE

14.1. Put questions to the following statements.

1. Photovoltaic solar panels convert sunlight into electricity. 2. Thomas Savery, an English military engineer and inventor, patented the first crude steam engine in 1698. 3. Human settlement on Mars will help our understanding of the origins of the solar system, the origins of life and our place in the universe. 4. Google is developing a new Android platform for automobile computers. 5. These companies have been producing gas turbines since 1992. 6. Michael Fred Phelps has won a total of 71 medals in major international long-course swimming competitions, including 57 gold, 11 silver and three bronze ones. 7. In many developing countries health and socioeconomic situation is unsatisfactory. 8. By the year 2000 the world's population had grown up to 6 billion. 9. When she was your age, she was looking after a tamagotchi, not a baby. 10. There are eight planets and five dwarf planets in the solar system.

14.2. Put the verbs in brackets in the proper tense form.

Most Important Lesson

When I was in my second month of the nursing school, our professor (to give) us a pop quiz. I (to be) a conscientious student and (to struggle) through almost all the questions, until I (to read) the last one: "What (to be) the first name of the woman who (to clean) the school?" Surely this (to be) some kind of joke. I (to see) the cleaning woman several times. She (to be) tall, dark haired and in her 50's, but how could I know her name? I (to hand) in my paper, leaving the last question blank. Just before class (to end), one student (to ask) if the last question would count towards our quiz grade. "Absolutely," said the professor. "In your future careers, you (to meet) many people. All are significant. They (to deserve) your attention and care, even if all you have to do is smile and say 'hello'." I never (to forget) that lesson. I also (to learn) her name was Dorothy.

14.3. Put the verbs in brackets in the proper tense form.

One Year on Mars: The Curiosity Rover

(Alan Taylor, August 5, 2013)

At approximately 1:30 AM East Coast time on August 5, 2012, the control room at the Jet Propulsion Laboratory in Pasadena, California, (to erupt) with cheers, high fives, hugs, relief, and tears. The Curiosity rover, which (to take) several years to be built and another year to travel away from Earth, (to land) safely on the surface of Mars. Millions of people (to watch) the landing on TV, through NASA's live stream. NASA (to choose), at considerable risk, to make Curiosity's landing on Mars an event, a spectacle, a drama that (to unfold) in nearly real time: one small step for a robot, one giant leap for robotkind.

Since its landing, Curiosity (to work) to explore the surface of Mars. It already (to make) discoveries that (to show) the existence of favorable conditions for microbial life billions of years ago, including evidence of an ancient streambed. It also (to make) significant measurements of the dangerous levels of radioactivity, which (to help) designers prepare for future manned missions to Mars. By the numbers: Curiosity (to send) us more than 190 gigabits of data, (to return) more than 72,000 images, and (to fire) more than 75,000 laser shots to investigate the composition of targets. Now the rover (to make) its way to the base of Mount Sharp, where it (to investigate) lower layers of a mountain that (to rise) three miles from the floor of Gale Crater.

14.4. Fill in the gaps.

1. When we ___ problems with our laptops, we normally ___ IT support.

a) has, calls b) had, called c) will have, will call d) have, call

2. Until about a decade ago, the office phone ___ the symbol of white collar work.

a) had been b) to be c) was d) is

3. Scientists ___ a new way of generating stem cells.

a) have developed b) has developed c) developed d) have been developing

4. In 2010, one of the World's longest traffic jams ___ in Beijing in China. It ___ 100 km long.

a) occur, is b) occurred, was c) has occurred, is d) is occurring, to be

5. A research ___ that by the year 2050 the number of cars ___ to 4 billion.

a) has estimated, will have risen b) estimated, have risen c) estimates, will rise d) estimate, will rise

6. How many genes ___ human beings ___?

a) does, have b) do, have c) -, has d) -, have

7. What ___ you feel sad?

a) does make b) makes c) make d) making

8. In the 2012 Olympics, the British ___ 29 gold medals.

a) won b) winned c) did win d) had won

9. This medicine ___ human ability to drive.

a) don't affect b) not affects c) not affect d) doesn't affect

10. They say that when Stradivarius ___ the wood for his violins he ___ on the trees and ___ how reverberant they ___.

a) chose, tapped, listened, are b) was choosing, tapped, listened, were c) had chosen, tapped, listened, were d) chose, was tapping, was listening, had been

11. In future, waste ___ a still greater problem.

a) will be become b) will becomes c) will become d) will became

12. I ___ interesting results. I ___ use them in my report at the conference.

a) obtained, am going to b) have obtained, am going to c) obtain, will d) have obtained, will

13. Recently, Japan ___ into orbit a tiny android robot as a companion for a human space traveller.

a) has sent b) sent c) sends d) will send

14. There is no doubt that many animal species ___ extinction.

a) faces b) has faced c) have been facing d) are facing

15. For many years governments ___ the ways to reduce carbon dioxide emissions.
a) are discussing b) have been discussing c) discuss d) have discussed
16. How long ___ Mars to orbit around the Sun?
a) it takes b) does it take c) does it takes d) it take
17. NASA's researchers ___ that Curiosity's explorations ___ them some clues about whether there ever was life on the red planet.
a) hope, will give b) hopes, will gives c) hoped, will give d) hope, gives
18. TGV trains in France ___ at a speed of more than 500 km/h.
a) run b) runs c) are running d) ran
19. Trainee surgeons are people who ___ to be surgeons.
a) learns b) are learning c) is learning d) learn
20. ___ around one trillion web pages in the Internet now.
a) They are b) There is c) It is d) There are

14.5. Fill in the gaps.
1. At present Canada ___ a high-speed rail system.
a) have not b) does not have c) do not have d) is not having
2. By the 17th century, temperatures in the Northern Hemisphere ___ by half a degree Celsius compared with medieval times.
a) was falling b) fell c) has fallen d) had fallen
3. Recently, a scientist at the University of Illinois ___ a tiny device that can measure a wearer's blood flow and wirelessly send that information to a computer.
a) has invented b) invent c) are inventing d) have invented
4. Computers ___ such games as chess already.
a) have mastered b) are mastered c) has mastered d) master
5. The human brain ___ a built-in talent for working out depth from flat images.
a) have b) is having c) had d) has
6. He ___ his mobile phone for already 3 hours.
a) has charged b) has been charging c) is charging d) was charging
7. They ___ the football match when the phone rang.
a) discussed b) were discussed c) were discussing d) are discussing
8. He gave his reasons for what ___.
a) was happened b) had happened c) has happened d) happened
9. She ___ till you come.
a) was working b) is working c) will be working d) worked

10. If he ___ a favourable review on his article, he will work still harder.
a) receive b) will receive c) will be receive d) receives
11. I suspect that ___ an error in these calculations.
a) it is b) there is c) is d) be
12. We will stay here while you ___ this experiment.
a) will be making b) are making c) were making d) make
13. By the end of the week we ___ these samples for a month.
a) will test b) will have been testing c) will be testing d) will have tested
14. The problem they ___ now is very urgent.
a) discusses b) is discussing c) are discussing d) discuss
15. Scientists ___ the existence of neutron stars as long ago as in 1934.
a) have predicted b) predicted c) has predicted d) had predicted
16. A man was stopped by the policeman when he ___ to cross the street at the red light.
a) was go b) was going c) had been going d) is going
17. He ___ from a business trip by the end of next week.
a) will return b) has returned c) returns d) will have returned
18. Today, nuclear power plants ___ in 31 of 196 countries.
a) are operating b) operates c) operate d) is operating
19. Experts predict that sales of hybrid and all-electric vehicles ___ 14 percent of the whole automotive market this year.
a) amount b) is going to amount c) will amount d) have amounted
20. Scientific journals ___ to publish studies with clear and specific conclusions.
a) is preferring b) prefer c) prefers d) is preferred
21. The journal ___ an editorial board of 800 academics by now.
a) has assembled b) has been assembled c) assembles d) is assembling
22. Peter Higgs ___ the existence of the particle nearly five decades ago.
a) has proposed b) has been proposed c) was proposed d) proposed
23. By the time we woke up, the snow ___.
a) had melted b) has melted c) melted d) will be melting
24. Scientists ___ for years that materials including rock, crystals and adhesives can produce an electrical signal as they fracture or crack under a load.
a) know b) knew c) are knowing d) have known
25. The Arctic ecological problems ___ a lot of attention right now.
a) receives b) are receiving c) receive d) receiving

15. ПАСИВНИЙ СТАН (PASSIVE VOICE)

Стан – це категорія дієслова, яка демонструє відношення дії до суб'єкта чи об'єкта дії.

Пасивний стан показує, що дія направлена на предмет або особу, які є підметом (наприклад, *статтю перекладено, дім будується*).

Приклади

Most cars use petroleum or diesel fuel. – активний стан (Active Voice) – Більшість машин використовують бензин або дизельне пальне.

Petroleum or diesel fuel is used by most cars. – пасивний стан (Passive Voice) – Бензин або дизельне пальне використовується більшістю машин.

Утворення

***to be* + Participle II**

Запам'ятайте! Пасивний стан вживається в тих же ситуаціях, що й активний стан, тобто для позначення дій, що повторюються регулярно, або загальновідомих фактів – Present Indefinite (Simple), для тривалих дій – Present Continuous тощо.

Запам'ятайте! У пасивному стані **лише допоміжне дієслово *to be*** змінюється за часом, особою та числом.

Приклад. Дієслово *to show* у всіх часових формах Passive Voice

	Past	**Present**	**Future**
Indefinite (Simple)	*was / were* shown	*am / is / are* shown	*will be* shown
Continuous	*was / were* being shown	*am / is / are* being shown	↥
Prefect	*had* been shown	*have / has* been shown	*will have* been shown
Perfect Continuous	↥	↥	↥

Ствердна форма

The battery **is charged** every day.

Питальна форма

У питальній формі змінюється порядок слів: перед підметом ставиться перше допоміжне дієслово.

Is the battery **charged** (every day)?

Заперечна форма

Заперечна частка ***not*** ставиться після першого допоміжного дієслова.

The battery **is not charged** (every day).

15.1. Put the sentences into negative and interrogative forms.

1. Suitcases and bags are usually checked at the customs. 2. The flight has been cancelled. 3. The power line was damaged by the storm. 4. More hybrid cars will be produced soon. 5. The students from other universities were invited to the scientific conference. 6. The goods will have been supplied by the end of the month. 7. Sound is transmitted through a wire as an electrical signal. 8. The message is being sent at the moment. 9. The errors in the program were being corrected the whole day. 10. The report had been published online before it appeared in newspapers.

15.2. Put the verb *to be* to the necessary form.

1. We were late because the roads ___ blocked by traffic jam. 2. Every day the swimming pool ___ filled with fresh water. 3. By the beginning of the experiment all the flasks ___ carefully disinfected. 4. Next year the conference ___ held in New York. 5. The time of the meeting ___ changed already. 6. Now we ___ told about the safety measures during the experiment. 7. Car parts ___ assembled on the moving assembly line. 8. The problem ___ solved for 3 hours already. 9. My broken bicycle ___ repaired by the mechanic the whole last week. 10. Don't worry. Your computer ___ fixed by tomorrow.

15.3. Rewrite the sentences from active into passive voice.

1. Amundsen and four other men reached the southern tip of the planet on December 14th 1911. 2. People all over the world study English. 3. Designers have supplied mobile phones with many advanced features. 4. Growing economies in many countries have put natural habitats at risk. 5. Ireland produces good quality foods. 6. On 1 February 2007, France prohibited smoking in public places, including offices and schools. 7. Soon some fast food outlets will introduce calorie labelling of the dishes they serve. 8. China's government is offering tax reduction and subsidies to

enterprises that apply greener technologies. 9. China has shut down some steel, paper and leather factories due to the pollution which they were causing. 10. By the beginning of the 20th century people had invented lots of useful thing we use today such as fountain pen, washing machine, vacuum cleaner, zipper and many others. 11. Astronomers are focusing their telescopes on more than 150,000 stars in search for extraterrestrial intelligence. 12. They will be analyzing the information coming from the satellites. 13. Mr. Jones is currently undertaking a fantastic cycling trip across the Eurasian continent from Britain to China. 14. Rapid economic growth has fuelled an explosive expansion in car ownership.

15.4. Open the brackets using the verb in the proper form of Passive Voice.

1. During the 2012 Olympics, bikes (to hire) 47,000 times on one day. 2. Several subterranean cycle parks (to build) in Tokyo lately. 3. Genes (to hand) down from parents to their children. 4. The mine ventilation system already (to check) thoroughly. 5. Lots of gossips (to distribute) via social networks now. 6. Credit cards (to introduce) first in 1951. 7. They promise the final test results (to publish) by Saturday noon. 8. In the last decade, about 500 planets orbiting other stars (to discover). 9. One of the largest tunnels in the world, City Water Tunnel No. 3, New York, (to build) from 1970 till 2013. 10. The idea of an atom (to suggest) first by the Greek scientists named Democritus. 11. A tortoise that (to collect) by Charles Darwin died at age of 176 in 2006. 12. The surface of Mars (to examine) by the Curiosity Rover now.

15.5. Fill in the gaps.

1. The London underground system ___ (often) “the tube”.
a) are called b) was called c) were called d) is called
2. The world’s first cash machine ___ in a Barclay’s bank in London in 1967.
a) is installed b) was installed c) installed d) was installing
3. Even after dozens of spacecrafts ___ to Mars, much remains unknown about this planet.
a) has been sent b) was sent c) sent d) have been sent
4. The DC’s Clean River project ___ by 2025.
a) will have been completed b) will be completed c) will complete d) is completed
5. All letters of the English alphabet ___ in the sentence “The quick brown fox jumps over a lazy dog”.

a) are using b) use c) are used d) is used

6. You cannot shut down the computer now because software ___.

a) has been installed b) is installed c) is installing d) is being installed

7. The first flying machine ___ by Leonardo da Vinci more than 400 years ago.

a) had been conceived b) was conceived c) is conceived d) has been conceived

8. By the mid-1990s, the production of 5¼-inch floppy disks ___ stopped.

a) has been b) is c) was d) had been

9. Clinical trials ___ now to evaluate the efficacy of Tamiflu against the H1N1 influenza virus.

a) are being continued b) are continued c) is continued d) were being continued

10. The Eiffel tower ___ completed for the Paris Exposition of 1889.

a) has been b) is c) were d) was

11. Many crucial issues of higher education ___ discussed at the conference now.

a) have been b) has been c) are being d) are

12. The accident at Fukushima nuclear power plant ___ triggered by the massive tsunami.

a) was b) is c) has been d) will be

13. Hopefully, solar-powered cars ___ widely used in the near future.

a) have been b) are c) will d) will be

14. By June 2008, the London Eye ___ visited by 30 million people.

a) was b) had been c) were d) has been

15. Drip and trickle methods of crops irrigation ___ used today to save water.

a) has been b) is being c) are being d) were

16. This lane ___ not usually lit at night.

a) was b) were c) is d) are

17. More than a million species ___ found on Earth to date.

a) are b) have been c) were d) will be

18. Since the Conficker virus ___ discovered in October 2008, it's estimated that as many as 12 million computers ___ affected globally.

a) is, are b) was, were c) has been, was d) was, have been

19. Missions to Europa and Jupiter's other moons ___ probably launched early in the 2020s.

a) will be b) was c) are d) were

20. New industrial and commercial development projects ___ the whole last month.

a) was examining b) were being examined c) will be examined d) examined

16. ОСОБЛИВОСТІ ВЖИВАННЯ ПАСИВНОГО СТАНУ

Речення у пасивному стані в англійській мові вживаються значно частіше, ніж в українській. Підметом речення в пасивному стані може бути прямий, непрямий, а також прийменниковий додаток.

Реченню в активному стані з **двома додатками** відповідають два речення в пасивному стані, наприклад: The teacher showed ***us*** **the new book.** 1) **We** were shown the new book. 2) **The new book** was shown to us.

При перетворенні в пасивний стан речення **з прийменниковим додатком** прийменник залишається на своєму місці – після дієслова: Everybody was looking **at him**. – **He** was being looked **at** by everybody.

Після **модальних дієслів** може використовуватись інфінітив у пасивному стані: You may use dictionaries during the lesson. – Dictionaries may **be used** during the lesson.

16.1. Rewrite the sentences in passive using both direct and indirect objects as subject, e.g.: He gave me a wrong address. – 1) A wrong address was given to me. 2) I was given a wrong address.

1. She told us the latest news. 2. The teacher showed them the results of the test. 3. I have sent him 10 messages. 4. The parents will present her a tablet for her birthday. 5. He has promised me financial support. 6. She never gives him a definite answer. 7. The postman brought her a parcel. 8. He is showing them the way to the hotel. 9. Somebody has left us a warning. 10. They will pay her 100 dollars for her work.

16.2. Rewrite the sentences in passive, e.g.: We sent him for the medicine. – The medicine was sent for.

1. Astronomers are looking for the planets with conditions capable of supporting life. 2. I will never deal with such people. 3. We always rely on him. 4. Everybody was attentively listening to the report. 5. They often refer to him as boss. 6. Scientists have been looking for evidence of life beyond earth for decades. 7. The engineer was carefully looking at the device readings. 8. We will dispose of this problem soon. 9. They take care of their flowers. 10. The company insisted on the terms of the agreement.

16.3. Rewrite the sentences in passive, e.g.: You can send the message by E-mail. – The message can be sent by E-mail.

1. Everybody must obey the laws. 2. You should never trust his promises. 3. Computer can control most of household appliances. 4. In most countries you must register your dog or cat in the police. 5. I have to recharge my telephone every week. 6. You needn't disturb him. 7. You may find these insect species everywhere. 8. One could easily solve this problem. 9. You shouldn't take children to horror movies. 10. No current technology can radically cut emissions from planes.

16.4. Choose one of the options.

Millionth English word

The idea of the millionth word entering the English language is a brilliant bit of public relations for Texas-based Global Language Monitor. GLM *runs / is run* a powerful search service which monitors web traffic. They *make / are made* their money telling organisations how often their name *mentions / is mentioned* in new media, such as the internet.

What they can also *do / be done* is search for newly coined words. Once a word *has used / has been used* 25,000 times on social networking sites and such like, GLM *declares / is declared* it to be a new word. By their calculations a new word *creates / is created* in English every 98 minutes, hence the estimate that the millionth word is about to *create / be created*.

If you *talk / are talked* to lexicographers, however, dictionary professionals, they will *tell / be told* you a slightly different story. Dictionaries have tighter criteria about what *constitutes / is constituted* a new word, for example, it has to *use / be used* over a certain period of time. Lexicographers will *tell / be told* you that the exact size of English vocabulary is impossible to quantify, but if you *accept / are accepted* every technical term or obscure specialist word then we're already way beyond a million. And if you *restrict / are restricted* inclusion of specialist slang, then there are possibly three quarters of a million words in English. All of which is way beyond the 20 – 40,000 words that a fluent speaker would *use / be used*, or the few thousand you could get by with in English. Basically with 1.5 billion people speaking some version of the language, it's small wonder English is the fastest growing tongue in the world.

16.5. Fill in the gaps.

1. Alien life form is something that ___ about in science fiction books but actually nobody ___ anything extra-terrestrial yet.

a) is writing, has been discovered b) writes, was discovered c) is written, has discovered d) have been written, discovered

2. Bamboo would be an ideal plant for Mars colonists to grow. It's fast growing, hard and can ___ to build furniture.

a) be using b) using c) use d) be used

3. Almost everyone ___ the Internet nowadays.

a) is been using b) is being used c) is used d) uses

4. On average 57 minutes a day ___ on the Internet in Britain.

a) spend b) are spent c) spent d) is spent

5. Watt ___(often) with inventing the steam engine.

a) is crediting b) credits c) credited d) is credited

6. Voyager 1 spacecraft ___ into space in 1977 to study the planets beyond our own.

a) had been launched b) was launched c) is launched d) was launching

7. The information from the Mars rover will ___ back to earth.

a) be sent b) send c) be sending d) have sent

8. Internet security experts warn that e-cards can ___ to spread viruses and spyware.

a) use b) using c) be used d) to be used

9. Much more research ___ to understand the origin of this disease.

a) needs b) need c) is needing d) is needed

10. In 1990s, this Indian company ___ 50,000 typewriters a year.

a) was producing b) was produced c) was being produced d) produces

11. He ___ the chance to correct his mistakes.

a) was giving b) gave c) had been giving d) was given

12. Our dean will ___ on TV tomorrow.

a) show b) be showing c) be shown d) being shown

13. Farmers all over the US ___ a growing challenge from so-called "superweeds" that are resistant to chemical weed killers.

a) are facing b) are faced c) is being faced d) were faced

14. The Space Age ___ the Earth's orbit littered with debris that can ___ the life of astronauts and damage satellites.

a) has left, endanger b) has been left, be endangered c) have left, endanger d) was left, been endanger

15. More than £20 million ___ on flowers on Valentine's Day in UK.

a) spent b) spend c) will spent d) is spent

14. A roadmap is a diagram that ___ the routes to get from one place to another.

a) is shown b) shows c) has been shown d) is being shown
17. New Japanese mobile phones can ___ how much radiation you ___ exposed to.
a) show, are being b) be shown, are c) show, have d) be shown, be
18. The price for the new gadget will ___ soon.
a) announced b) be announcing c) announce d) be announced
19. A 20-year-old hacker ___ recently in northern France for spreading a virus on smartphones that ___ tiny sums of money from the unsuspecting user.
a) has arrested, was stolen b) has been arrested, was stealing c) arrested, stole d) was arrested, has been stolen
20. Machu Picchu, the famous Incan city in Peru, ___ 100 years ago.
a) was discovered b) was being discovered c) discovered d) has discovered

17. МОДАЛЬНІ ДІЄСЛОВА НА ПОЗНАЧЕННЯ МОЖЛИВОСТІ, ДОЗВОЛУ, ЗДАТНОСТІ
(can, may та їхні еквіваленти)

Modal Verb + Infinitive

Can		
Вміння	He can ride a bicycle.	Він вміє їздити на велосипеді.
Дозвіл	You can take my umbrella.	Ви можете взяти мою парасольку.
Ймовірність (теоретична)	You can find this word in any dictionary.	Це слово можна знайти в будь-якому словнику.

Could		
Вміння у минулому	He could play chess at 5.	Він вмів грати в шахи у 5 років.
Ввічливе прохання	Could you tell me the time?	Не могли б Ви сказати мені, котра година.
Ймовірність **- у майбутньому;** **- зараз**	One day he could become a great scientist. He could be the only one who knows this.	Можливо, одного дня він стане великим вченим. Можливо, він єдиний, хто знає це.

May		
Дозвіл	You may call me whenever you want.	Ви можете дзвонити мені, коли забажаєте.
Ймовірність **- у майбутньому;** **- зараз**	It may rain tonight. You may find him in the library.	Можливо, сьогодні ввечері буде дощ. Можливо, ви знайдете його в бібліотеці.

Might		
Дозвіл в минулому	The teacher said that we might use dictionaries.	Вчитель сказав, що ми можемо користуватись словниками.
Ймовірність **- у майбутньому;** **- зараз**	It might (< may) rain tonight. You might find him in the library.	Можливо, сьогодні ввечері буде дощ. (але малоймовірно) Можливо, ви знайдете його в бібліотеці. (але я не впевнений)
Докір	You might tell me what he did.	Ви могли б мені розказати, що він зробив.

Ймовірність: may > might > could

to be able to	**(Еквівалент дієслова *can* в значенні здатності)**
He *is able* to do it.	Він в змозі це зробити.
He *was able* to do it yesterday.	Він зміг зробити це вчора.
He *will be* able to do it tomorrow.	Він зможе зробити це завтра.
He *has been able* to swim since childhood.	Він вміє плавати з дитинства.

to be allowed to	**(Еквівалент дієслова *may* в значенні дозволу)**
We *are allowed* to take these books.	Нам дозволяють брати ці книжки.
We *were allowed* to take these books.	Нам дозволили взяти ці книжки.
We *will be allowed* to take these books.	Нам дозволять взяти ці книжки.

17.1. Put the sentences into negative and interrogative forms.

1. We can arrange the communication via the Internet. 2. Changing the chemistry of the oceans may cause a mass extinction of sea life. 3. A contact with extraterrestrial life might really happen one day. 4. This machine can turn plastic into petrol. 5. Ancient Chinese astrologers could predict solar eclipses by the motion of the moon. 6. Some people are always able to remember their dreams. 7. You may copy this file from my memory stick. 8. The students will be allowed to repeat this experiment themselves. 9. The abacus could only be used for arithmetic tasks. 10. One can see many applications of laser technology today.

17.2. Insert modal verbs *can, could, may, might* or their equivalents.

1. Smartphones ___ take photos and search the internet. 2. Until recently, millions of people ___ not afford buying a telephone. 3. The researchers hope that NASA observational missions ___ prove this new theory within a year. 4. As CO2 emissions continue to increase, many shell-forming species ___ not survive the next 50 – 100 years. 5. Last year poll revealed that the top four things people ___ not live without were an internet connection, a television, a cuddle and a trustworthy best friend. 6. Environmentally-friendly technologies ___ help solve some of the country's energy problems. 7. Before 1918, no women ___ vote in parliamentary elections in the UK. 8. Electric bikes ___ run up to 15 miles an hour. 9. You ___ help the girl. Her suitcase is so heavy. 10. It ___ be dangerous to be cycling in a city centre, especially in heavy traffic.

17.3. Choose one of the given options.

1. This research *may / is allowed* to help doctors predict some diseases. 2. The human brain *can / may* perform multiple operations simultaneously. 3. In ancient Greece only men *were able / were allowed* to vote. 4. Charles Babbage *might / could* not complete his "Analytical Engine" because of lack of funding. 5. Humans *can / may* hear frequencies between 20-20,000 Hertz. 6. One of Asimov's Three Laws on robots' behaviour stated that robots *might / could* not injure a human being. 7. It is predicted that within 100 years from now, nanorobots will flow around our body fixing cells, and *will be able / will can* to record our memories. 8. Mendeleev *could / was able to* predict the properties of elements which had not yet been discovered. 9. The chief of the department is out but you *may / are able to* leave your message for him if you

want. 10. He didn't have the proper software, so he *was not allowed / was not able* to view videos.

17.4. Translate into English using modal verbs.

1. Можливо, трапиться чудо, і він нарешті повернеться. 2. Супер-комп'ютери можуть вирішувати надскладні задачі, такі як фізичне моделювання, дослідження клімату тощо. 3. Ще у часи Юлія Цезаря люди вміли шифрувати повідомлення. 4. Вчені досі не змогли визначити, що таке темна матерія. 5. Після операції йому дозволять встати тільки через 3 дні. 6. Вам не можна тут залишатися. 7. Не могли б Ви притримати двері? 8. Через декілька років люди зможуть вирушити на Марс. 9. Можна я скористаюсь Вашим телефоном? В моєму сіла батарея. 10. Колись він вмів вільно говорити французькою. 11. Мій комп'ютер не зміг перезавантажитись через вірус. 12. Можна я змішаю ці дві речовини? 13. Ви могли б залишити цю розмову на потім. Зараз немає часу на неї. 14. Першим астронавтам дозволялось взяти у космос до п'яти фунтів особистих речей. 15. Як люди, так і тварини не можуть жити без води.

17.5. Fill in the gaps.

1. The aim of the exhibition in British Museum is to show that certain key objects ___ demonstrate man's development from stone-age tools to the modern credit card.
a) is able to b) can c) are allowed to d) might
2. According to scientists from Oxford University, understanding viruses ___ provide clues to the early detection of cancers or infections.
a) could to b) was allowed c) are able d) may
3. ___ remind us of some of the words we have learnt?
a) Could you b) May you c) Do you can d) Can you to
4. According to Transportation Security Administration, you ___ to bring sharp objects such as knives scissors on an airplane.
a) are not able b) may not c) cannot d) are not allowed
5. According to the report of the Nigerian National Bureau of Statistics, absolute poverty is measured by the number of people who ___ afford only shelter, food and clothing.
a) could b) may to c) is able d) can

6. The U.S. Department of Transportation's Federal Aviation Administration says that soon passengers will ___ to read e-books, play games, and watch videos on their devices during all phases of flight.
a) can b) could c) be able d) able
7. A recent patent suggests that Apple ___ turn the iPhone into an answering machine.
a) are able to b) might c) is able d) is allowed
8. 30 years ago, one ___ buy a pass for lifelong, unlimited first-class travel with American Airlines.
a) could b) can c) may d) might
9. There are laws and regulations that have been signed up by many countries about what we ___ and ___ do on the moon.
a) not can, are able to b) can, cannot c) can, could d) able to, might
10. After the Restoration in 1660, Charles II brought an innovative addition to the English theater: women ___ to take the stage as actresses.
a) were allowed b) were able c) could d) might
11. The doctor told her that she ___ not use too much salt in her food.
a) can b) could c) may d) might
12. The fog came down and we ___ reach the summit of the mountain.
a) could not b) may not c) were not able to d) were not allowed
13. There are certain goods that you are not ___ bring into the UK under any circumstances.
a) may b) can c) able to d) allowed to
14. Experts think that many of stellar systems ___ have up to twenty or thirty planets with lunar-type satellites and asteroids.
a) may b) may to c) are able d) is able to
15. In the 1800s, crossing the USA from coast to coast, which now takes less than a day, ___ take weeks.
a) might b) may c) can d) could
16. Researchers say night-vision contact lenses ___ possible in future.
a) maybe b) may be c) may to be d) might will be
15. Experts predict that in 2020 people ___ to purchase robots through Amazon-type vendors.
a) will can b) will be able c) may d) could
18. In five to ten more years, we ___ ___ 3D-print many useful things such as building blocks for houses, clothes, and even trees.

a) can, be allowed to b) may, might c) may, be able to d) can, can

19. The year 2013 ___ someday be known as “the year of the comets”.

a) can b) may c) is able to d) be able to

20. Two students at a Scottish university have been taking part in an experiment to see if astronauts will ___ to travel to the red planet one day.

a) be able b) can c) could d) may

18. МОДАЛЬНІ ДІЄСЛОВА НА ПОЗНАЧЕННЯ НЕОБХІДНОСТІ, ОБОВ’ЯЗКУ, ПОРАДИ

(must, should, ought to, need та їхні еквіваленти)

Must (Must not = mustn’t – заборона)		
Обов’язок	Students must attend classes. You must not press this button.	Студенти повинні відвідувати заняття. Не можна натискати цю кнопку.
Ймовірність	You must know this teacher.	Ви, напевно, знаєте цього викладача.

Have to		
Замість дієслова *must* у минулому та майбутньому	Yesterday I had to bring the books back to the library. Next week I will have to bring the books back to the library.	Вчора я повинен був здати книжки до бібліотеки. Наступного тижня я повинен буду здати книжки до бібліотеки.
Необхідність в певних обставинах	I have to charge my telephone every week.	Мені доводиться перезаряджати телефон кожного тижня.
Відсутність необхідності (тільки в негативній формі)	There are no classes on Saturday. We don’t have to get up early.	В суботу занять немає. Нам не треба прокидатись рано.

Should = Ought to		
Порада, рекомендація	You should spend more time out of doors.	Вам слід більше часу проводити на свіжому повітрі.
Моральний обов'язок	We should take care of nature.	Нам слід дбати про природу.

Need (?) Needn't		
Чи є необхідність?	Need I restart my computer after installing this program?	Чи треба мені перевантажувати комп'ютер після встановлення цієї програми?
Немає необхідності	You needn't restart your computer after installing this program.	Вам не треба (можна не) перевантажувати комп'ютер після встановлення цієї програми.

Увага! ***Need*** може бути звичайним (немодальним) дієсловом. Порівняйте:
He needs some advice. He needs to call to the dean's office. (Те ж саме неможливо сказати з модальним *need*)
Does he need to call to the dean's office? = *Need he call* to the dean's office?
He *doesn't need to call* to the dean's office. = He *needn't call* to the dean's office.

to be to		
Необхідність, пов'язана з розкладом чи планом	We are to pass our exams in June.	Ми повинні складати екзамени у червні.
Необхідність, пов'язана з домовленістю	He is to meet me near Shevchenko monument.	Він повинен зустріти мене біля пам'ятника Шевченку.

Увага! Дієслово ***to be*** в модальному значенні не використовується у майбутньому часі.

Увага! Модальні дієслова можуть вживатись також з **інфінітивом у Passive Voice,** наприклад**:** You must send all the papers by May, 20. – All the papers must be sent by May, 20.

18.1. Compose sentences with modal verbs in writing. Translate them into your native language.

I You He She We They	must mustn't have (has) to should shouldn't needn't	pay more attention to my (your / his / her / etc.) spelling. go on foot to work because there is no transport running nearby. smoke at a fuel station. bring any vegetables. We have lots of our own garden-stuff. follow the rules and regulations while passing the customs. use your mobile phone during the performance.

18.2. Fill in the gaps with the modal verbs *must, should, ought (to), need, have (to), be (to)*.

1. Passengers ___ not smoke on board a plane. 2. If you have important documents, you ___ back them up on a memory stick in case there are problems with your computer. 3. Compulsory education means that you ___ attend some educational institution. 4. Now we ___ not go to the booking office to buy a train ticket. We can easily do it through the Internet. 5. Emissions from aviation in rich countries ___ be reduced dramatically. 6. Before I received my driving license I ___ to pass special exams. 7. The students' scientific conference ___ start in a week. 8. You ___ always use security software on your computer and keep all your passwords private. 9. His daughter has won the competition. He ___ be very proud of her. 10. Babbage's calculating machine consisted of thousands of parts and all of them ___ be made by hand.

18.3. Choose the appropriate modal verb.

1. Genes tell our bodies how they *should / have to* grow and develop. 2. *Must / Need* we have a face-to-face meeting? – No, we *can / should* do it over the phone. 3. The cornerstone of good cyber security has / have to be based on education. 4. The Australian Greens have said radioactive waste *should / need* be stored at the country's only nuclear facility on the outskirts of Sydney. 5. It you want to arrange a meeting you will *have to / must* check if everyone *can / are to* attend. 6. Rock climbing is very

dangerous. You *cannot / shouldn't* take the risk. 7. Lexicographers say a word *must / can* be used over a certain period of time before it *must / may* be added to a dictionary as a new entry. 8. With electric bike you *don't need / needn't* worry about headwinds. 9. People *can / ought* to be proud to speak their language to ensure it survives. 10. The enterprises causing high levels of pollution *may / should* be shut down or reequipped.

18.4. Translate into English.

1. Перед польотом всі системи космічного корабля мають бути ретельно перевірені. 2. За розкладом зустріч повинна розпочатися через 2 години. 3. Старе обладнання на заводі слід замінити на більш сучасне. 4. Сьогодні немає потреби тримати всю документацію на папері. Ви можете легко зберігати документи в комп'ютері. 5. Не можна використовувати напругу вище 12 вольтів у вологих приміщеннях. 6. Не слід покладатись на приблизні дані. Всі параметри необхідно обчислити точно. 7. Чи необхідно всім пасажирам заповнювати декларацію? 8. Ми повинні захищати навколишнє середовище. 9. Коли ви працюєте з отруйними речовинами, необхідно вживати заходів безпеки. 10. Вам слід повторити деякі розділи квантової механіки.

18.5. Fill in the gaps.

1. What ___ I do if I saved some files to my hard drive and they have disappeared?
a) must b) should c) may d) ought
2. He ___ be an expert in computers. He has fixed all my problems in several minutes!
a) can b) is c) must d) have to
3. Thanks to constant research, we ___ know much more about genes and inheritance.
a) can b) must c) need d) has to
4. If you need ___ a meeting, you ___ call all the participants.
a) set up, must b) set up, ought c) to set up, are d) to set up, should
5. I am almost out of time. I ___ go.
a) have to b) may c) might d) am
6. At work, we're not ___ give out personal details.
a) must b) may c) allowed to d) have to
7. Both drivers and pedestrians ___ obey the traffic rules.
a) ought b) can c) may d) must
8. When cycling, you ___ wear a helmet and fluorescent closing.

a) must b) should c) have to d) may

9. The results of the experiment ___ to be verified.

a) must b) should c) are d) can

10. He couldn't pay for the meal in a restaurant, so he ___ to ring his wife to bring him some money.

a) was able b) was c) had d) should

11. When writing a scientific paper, you ___ follow all of the usual writing rules – spelling, grammar, punctuation, sentence structure, etc.

a) can b) must c) ought d) may

12. Currently, the battery of an electric car ___ be fully charged in a few hours.

a) need b) might c) must d) can

13. Now you ___ buy and keep books on your shelves, you ___ download thousands of books onto one digital device.

a) needn't, can b) mustn't, cannot c) shouldn't, mustn't d) may, cannot

14. Spilled chemicals ___ to be wiped up immediately.

a) may b) must c) are able d) ought

15. We ___ to see the moon because it reflects light from the sun.

a) can b) might c) are able d) are allowed

16. To fight climate change, the entire world will ___ eat less meat.

a) be to b) have to c) must d) be allowed to

17. Broken friendship ___ be soldered, but will never be sound.

a) may b) must c) should d) has to

16. You ___ feed wild animals in the zoo. It's forbidden.

a) cannot b) can c) mustn't d) must

19. As floods and hurricanes are becoming more commonplace, the countries ___ to prepare long-term programmes to deal with climate change.

a) should b) must c) has d) have

20. With studying a language, as with any worthwhile endeavor, you ___ practice in order to improve.

a) may b) must c) have d) might

19. МОДАЛЬНІ ДІЄСЛОВА З PERFECT INFINITIVE

Припущення, можливість, здивування

must (певно, можливо)	**+ Perfect Infinitive (have + Participle II)**	They must have launched the satellite. Напевно, вони вже запустили супутник.
may, might (можливо)		He may (might) have passed his exams. Можливо, він вже склав іспити.
can't (не може бути, щоб)		He can't have proved the theorem. Не може бути, щоб він доказав цю теорему. (Він не міг доказати цю теорему.)
can (?) (невже)		Can he have lost his mobile phone? Невже він загубив свій мобільний телефон?

Докір, відсутність необхідності у минулому

could, might (міг би)	**+ Perfect Infinitive (have + Participle II)**	You could have got up earlier. Ви могли б прокинутись раніше. (але не прокинулись)
should (слід було)		You should have turned off the iron. Вам слід було вимкнути праску. (а ви не вимкнули)
shouldn't (не слід було)		You shouldn't have told him about it. Вам не слід було казати йому про це (а ви сказали)
needn't (не треба було, можна було й не)		You needn't have copied all the documents. Вам не треба було копіювати всі документи. (можна було й не копіювати всі документи.)

19.1. Translate into your native language paying attention to the form of the Infinitive.

1. He must be busy now. – He must have been busy yesterday. 2. It may take you several hours to assemble this device. – It may have taken you several hours to

assemble this device. 3. This substance cannot dissolve in water. – This substance cannot have dissolved so quickly. 4. Can he know the truth? – Can he have known the truth all this time? 5. You could find a better solution than this. – You could have found a better solution than that. 6. You should spend more time in the open air. It's good for your health. – You should have spent more time in the open air. You are so pale. 7. The test is coming. You should repeat all the material studied. – Your test results are poor. You should have repeated all the material studied more thoroughly. 8. You shouldn't touch the moving tool. It's dangerous. – You shouldn't have touched the moving tool. I warned you. 9. You needn't take an umbrella. They promise no rain today. – You needn't have taken the umbrella. There was no rain as they had promised.

19.2. Rephrase the sentences using modal verbs in brackets. Example: 1) ***Probably, he didn't attend classes. (may) – He may not have attended classes.*** **2)** ***Is it possible that he missed the train? (can) – Can he have missed the train? 3) I can't believe he has failed at the exam. (can't) – He can't have failed at the exam.***

1. Probably, this discovery went unnoticed. (must) 2. Probably, the bearings were not lubricated properly. (may) 3. Probably, the aircraft has already landed. (might) 4. Perhaps, it was broken insulation that caused short circuit. (must) 5. Perhaps, these species have become extinct due to the destruction of rain forests. (might) 6. Is it possible that he forgot about her birthday? (can) 7. Is it possible that the ancient Greeks knew about the existence of America? (can) 8. Is it possible that he had no experience in driving? (can) 9. I can't believe you have never heard about this writer. (can't) 10. I can't believe that he scored a goal. (can't) 11. I can't believe that it was impossible to restore the damaged file. (can't) 12. I can't believe that the particle has deviated from its orbit. (can't)

19.3. Choose the best answer to explain the given situations.

1. A very important document has disappeared from my desk a moment ago.

a) It can't have melted into thin air.

b) It must have melted into thin air.

2. The liquid has become cloudy.

a) Bacteria must have grown there.

b) Bacteria can't have grown there.

3. The litmus paper turned red.

a) They must have added acid to the solution.
b) They can’t have added acid to the solution.
4. The sample does not attract to the magnet.
a) It can’t have been made of metal.
b) It must have been made of metal.
5. I can’t find my mobile phone.
a) I can’t have left it in the restaurant we had dinner at last evening.
b) I must have left it in the restaurant we had dinner at last evening.
6. Dan passed his exams with excellent grades despite the fact that he didn’t prepare.
a) The exam must have been very difficult.
b) The exam can’t have been very difficult.
7. The police knew every detail of their phone conversation.
a) They can’t have done some wiretapping.
b) They must have done some wiretapping.
8. Christie did the opposite of what I asked her to do.
a) She can’t have misunderstood what I said.
b) She must have misunderstood what I said.
9. I cannot undo the nut.
a) It must have rusted.
b) It can’t have rusted.

19.4. Translate into English using Modal verbs with Perfect Infinitive.

1. Це неймовірно! Ця частинка не могла рухатися швидше ніж швидкість світла. 2. Наші вчені, напевно, вже винайшли ліки проти цієї хвороби. 3. Можливо, двигун зламався через механічні проблеми. 4. Невже вірус пошкодив операційну систему? 5. Зв’язок з супутником, напевно, був втрачений через відмову бортового комп’ютера. 6. Невже він вже отримав диплом бакалавра? 7. Напевно, всі люди вже зрозуміли переваги здорового способу життя. 8. Не може бути, щоб ці меблі були виготовлені з соломи. 9. Вам слід було дати оголошення в газету. 10. Можна було й не резервувати номер в готелі. В цей сезон готелі напівпорожні. 11. Вам не слід було обганяти враз три машини. Це було дуже небезпечно. 12. Вам слід було задати параметри системи з більшою точністю. 13. Компанії слід було врахувати всі вимоги замовників. 14. Не було необхідності викликати пожежних. Вогонь швидко загасили за допомогою вогнегасника. 15. Йому слід було давно позбутись цих старих речей.

19.5. Fill in the gaps.

1. A newspaper office used to be very noisy, with lots of phones ringing and urgent phone conversations. That must ___ an exciting atmosphere.

a) was b) to be c) have been d) be

2. You ___ have seen David at work. He is on holiday in France.

a) must b) can't c) should d) needn't

3. There is a speed limit sign ahead. You should ___ down.

a) slow b) to slow c) have slowed d) not slow

4. I think that both cyclists and drivers ___ to pay more attention to the Highway Code.

a) can b) should c) must d) need

5. Scientists say they may ___ the best evidence already for water on Jupiter's frozen moon.

a) found b) find c) have found d) have to find

6. Green tech can not only ___ improve the environment but also the business climate too.

a) helped b) to help c) have helped d) help

7. You ___ have heard that Ireland was one of the first places in the world to implement a smoking ban in public places.

a) can b) may c) should d) needn't

8. If the PV electricity production exceeds building demand then the excess ___ exported to the grid, and vice versa.

a) can't be b) can be c) can have been d) can't have been

9. I was sitting at the back row and heard almost nothing. You should ___ more loudly.

a) speak b) spoke c) spoken d) have spoken

10. You ___ have copied the document by hand. You could ___ a Xerox. It's available free.

a) need, to use b) shouldn't, have been used c) should, be used d) needn't, have used

11. You should ___ your abstract to the conference committee as soon as possible, otherwise it won't be included into the conference papers.

a) to submit b) submit c) have submitted d) have been submitted

12. Students who take regular classes must ___ all fees charged to their account by the fee payment deadlines.

a) to pay b) have paid c) be paid d) pay

13. The fish in the lake has died. – It ___ by the toxic waste from the factory.
a) must have been poisoned b) should poison c) should be poisoned d) may be poisoned
14. The hurricane caused huge damage to the transmission lines. Crews of engineers and operational stuff ___ overnight to restore power supply for the whole area.
a) can work b) should have worked c) had to work d) can't have worked
15. He can't ___ the eclipse. It could ___ only in the Southern Hemisphere.
a) watch, see b) have watched, be seen c) watch, have seen d) have watched, see
16. The water in the well has unpleasant smell. It might ___ with some chemicals.
a) have contaminated b) contaminate c) contaminated d) have been contaminated
17. The engineers have presented new sensors that ___ without cooling in hostile environments.
a) can operate b) can have operated c) can't operate d) can't have operated
18. Children should ___ from early childhood to keep their home clean.
a) teach b) not teach c) be taught d) have taught
17. With the new technology, the company ___ to process 5 times more waste with only 10 workers.
a) can b) may c) will be able d) have
20. The reason for the satellite launch failure may ___ a mistake in calculations.
a) be b) have been c) to be d) was

20. УЗГОДЖЕННЯ ЧАСІВ

Запам'ятайте! Якщо у головному реченні використовується присудок у **минулому часі**, то й у підрядному реченні присудок повинен бути в одній з форм **минулого часу**, а саме:

Головне речення		***Підрядне речення***
Past Simple	1. для одночасної дії (в укр. мові – теперішній час)	Past Simple **V-ed / V-II** Past Continuous **was / were + V-ing**
	2. для дії, яка мала місце раніше (в укр. мові – минулий час)	Past Perfect **had + V-ed / V-III**
	3. для майбутньої дії (в укр. мові – майбутній час)	Future-in-the-Past **would (might / could) + V**

Приклади

He said that Він сказав, що	she often went to conferences. вона часто їздить на конференції.
	she had gone the conference the week before. вона поїхала на конференцію минулого тижня.
	she would go to the conference the next week. вона поїде на конференцію наступного тижня.

20.1. Translate into your native language paying attention to the sequence of tenses.

1. Nobody expected that he would ever be able to do it. 2. It seemed that everything was quite all right. 3. He told them what had happened to him in Paris. 4. We knew that he was writing a new novel. 5. He declared that he would defend his rights. 6. She said that similar questions might be asked at the examinations. 7. We heard that she had become a champion. 8. He saw that the ship was leaving.

20.2. Choose one of the options.

1. He said he (is staying, was staying) at the «Ritz» Hotel. 2. They realized that they (lost, had lost) their way in the dark. 3. He asked me where I (study, studied). 4. I thought that I (will finish, would finish) my work at that time. 5. He says he (works, worked) at school two years ago. 6. Michael said he (is, was) very busy. 7. I thought he (told, had told) you about the party. 8. My friend asked me who (is playing, was playing) the piano in the sitting-room. 9. He said he (will come, would come) to the station to see me off. 10. I was sure he (posted, had posted) the letter. 11. I think the weather (will be, would be) fine next week. I hope it (will not change, would not change) for the worse. 12. I knew that he (is, was) a very clever man. 13. 1 want to know what he (has bought, had bought) for her birthday. 14. I asked my sister what she (has seen, had seen) at the museum.

20.3. Render these sentences in the past.

1. My friend says he has spent the whole month at the sea-side. 2. His friends say they are spending most of their time on the beach. 3. My uncle says he takes lots of pictures while travelling in the mountains. 6. Mother says Nick will tell us a lot of interesting stories that happened to him. 7. Her sister says that last time she was at the sea many years ago. 8. She says she will go there next summer.

20.4. Put the verbs in brackets into the proper form.

1. I knew that John currently (to work) at a new project. 2. Mike hoped that his friend (to help) him with his technical drawing. 3. We didn't know the score, but we were sure their team (to lose) the game. 4. Yesterday Tom learned that his aunt (to be) ill for two months. 5. The children were afraid of making any noise because Mom (to sleep). 6. He said that he (to trust) me. 7. We were told that Andrew (to go) to enter that college. 8. My parents decided that we (to celebrate) my birthday on Saturday. 9. The student wasn't able to do the translation because he (not / to know) some special terms. 10. Ann wasn't informed that the lecture (to take place) the next Friday.

20.5. Translate into English.

1. Він сказав, що любить проводити свою відпустку на морі і збирається поїхати туди цього літа. 2. Аня була рада, що вся сім'я прийшла в аеропорт зустріти її після прибуття з Лондона. 3. Вчений не мав певності, що він зможе завершити експеримент вчасно. 4. Я був засмучений, що всі квитки в театр опери та балету вже продано. 5. Студенти зраділи, що наступного року всі лекції будуть читати англійською. 7. Він повідомив, що в нього ще немає ніякої інформації щодо результатів досліджень.

21. ПРЯМА ТА НЕПРЯМА МОВА

У непрямій мові обставинні слова змінюються:

Пряма мова	**Непряма мова**
today	that day
yesterday	the day before
tomorrow	the next day
... ago	... before
this (these)	that (those)
here	there
last year	the year before
next ...	the next (following) ...

Перетворення спонукальних речень в непрямій мові

Keep quiet! Don't make noise!	
He told (asked) me	to keep quiet and not to make noise.

Перетворення стверджувальних речень з прямої в непряму мову

I am an engineer. I work at a plant. In the evening I study English.		
He said He told	that	he was an engineer and worked at a plant and added that he studied English in the evening.
I saw my friend yesterday.		
He said He told	that	he had seen his friend the day before.
We lived in Rome two years ago. My father worked there.		
He said He told	that	they had lived in Rome two years before and added that his father had worked there.
I will tell you about it tomorrow.		
He said He told	that	he would tell me about it the next day.

Час підрядного речення **не змінюється**, якщо підрядне речення є висловлюванням, що не викликає заперечень. Наприклад, “The earth is round,” said the teacher. – The teacher said (that) the earth is round.

Past Continuous зазвичай не змінюється: “I was travelling to Brighton while she was flying to the USA,” he said. – He said he was travelling to Brighton while she was flying to the USA.

Модальні дієслова *would, could, might, should, ought to* не змінюються у непрямій мові: “He might visit us,” Mum said. – Mum said that he might visit us.

Питання в непрямій мові

Спеціальні питання

Пряма мова	**Непряма мова**
He asked (me),	He asked me
“What are you doing?”	what I was doing.
“Where do you live?”	where I lived.
“Where does he work?”	where he worked.
“What is Nick doing?”	what Nick was doing.
“What have you prepared for today?”	what I had prepared for that day.
“When did you come home yesterday?”	when I had come home the day before.
“When will your mother come home?”	when my mother would come home.

Загальні питання

Пряма мова		**Непряма мова**		
He asked me,	**“Are** you **watching** TV?”	He asked me	if / whether	I **was watching** TV**.**
	“Do you **play** chess?”			I **played** chess.
	“Does she **go** to school?”			she **went** to school.
	“Have you **done** your homework?”			I **had done** my homework.
	“Did you **skate** last winter?”			I **had skated** last winter.
	“Will you **see** your friend tomorrow?”			I **would see** my friend the next day.

21.1. Render the sentences as indirect speech using the verbs in brackets.

1. Close the door, please. (tell) – The teacher ___. 2. Will you hold these books for a moment, please? (ask) – The librarian ___. 3. Please don’t tell anyone about what happened. (ask) – Mike ___. 4. Keep silence! (tell). The teacher ___. 5. Could you give me a lift? (ask) – Jack ___. 6. Put on your hat and scarf at once! (tell) – Mother ___.

21.2. Render the sentences in indirect speech.

1. The researcher explained, “We are going to start the experiment when all the equipment is thoroughly checked”. 2. The expert said, “Lasers are now widely used for medical purposes”. 3. The teacher said, “Radio waves have been used since 1931 to investigate celestial objects”. 4. The oceanographer said, “We will develop innovative techniques to restore aquatic ecosystems next year”. 5. The manager said to me, “I offer you a part-time job on your computer”. 6. The physicist said to the journalist: “We have already installed the accelerator”. 7. The lecturer said, “The neutron was discovered in 1932”. 8. The researcher declared, “The development of the electronic computer changed the scientific world”. 9. The librarian said to the students, “Don’t forget to bring the books back to the library at the end of the term!” 10. The receptionist said to the guest “Please, check out before 10 o’clock”.

21.3. Make the sentences indirect starting them with the words in brackets.

1. The children are playing in the yard. (She thought) 2. Her friend will come to see her. (She hoped) 3. Father has repaired his bicycle. (He thought) 4. She knows

English very well. (I supposed) 5. Our sportsmen will win the game. (We were sure) 6. She made no mistakes in her dictation. (She was glad) 7. They live a happy life. (I knew) 8. He is a very talented singer. (I was told) 9. My cousin hasn't received a very interesting offer from his company yet. (I learnt) 10. He does not know German at all. (I found out)

21.4. Make the sentences indirect starting them with the words in brackets.

1. Where is she going? (He didn't tell anybody) 2. How much did she pay for the dinner? (I had no idea) 3. Where is he? (Did you know) 4. Where does he live? (Nobody knew) 5. When are they leaving for abroad? (I wanted to know) 6. Where did she buy this bicycle? (He wanted to know) 7. Where has he just gone? (Did you know) 8. When will he come back? (She asked them)

21.5. Make the sentences indirect starting them with the words in brackets.

1. Can people reduce carbon dioxide emission? (They asked) 2. Does she know some poisonous chemicals really escape into the atmosphere? (He asked) 3. Are you going to call on our friends tonight? (They asked) 4. Will the family celebrate next Christmas together? (John wondered) 5. Is my friend the best student in his group. (She wanted to know) 6. Have you used your dictionaries during the test? (The other students asked) 7. Did they have lunch at the student's canteen yesterday? (He asked) 8. Is the bus service running according to the timetable today? (He wondered)

21.6. Make the sentences indirect starting them with the words in brackets.

1. Where did I put the book? (I forgot) 2. Who has given you this nice kitten? (She wanted to know) 3. Where can I buy an English-Russian dictionary?(He asked me) 4. How long will it take your brother to get to Madrid? (He wondered) 5. Did Susan see the dean this morning? (I asked) 6. Have they sold the picture? (I did not know). 7. Do they know anything new about the travellers? (I wondered) 8. Is he coming back today? (I was not sure) 9. Are there any more books here? (The man asked). 10. Did she go shopping yesterday? (I wanted to know) 11. Does she know the name of the man?(I doubted)

21.7. Render in indirect speech.

1. She asked me, “What are you doing?” 2. He asked her, “Are you angry with me?” 3. I asked him, “Where do you work?” 4. I asked her, “When will you join our team?” 5. They asked us, “Did you see the monument?” 6. She asked him, “Can you promise me that?” 7. He asked me, “Where will you go?” 8. We asked them, “Have you made up your minds?”

21.8. Render in indirect speech.

1. John said to Nick, “Where are you going?” 2. Ann said to Mike, “When did you leave London?” 3. She said to Boris, “Please, don’t forget to buy tickets.” 4. Jane said to me, “How can I get to the station?” 5. Tom said to Mary, “What time will you come tomorrow?” 6. My friend said to me, “Did you come here yesterday?” 7. Peter said to Nick, “What time does the train start?” 8. The teacher said to us, “Have you made this exercise?” 9. Mother said to her son, “Put on your coat” 10. Nick said to Alice, “Don’t make noise. My sister is sleeping.” 11. Sam said to Jane, “Yesterday I talked to our dean.” 12. Tommy said to his sister, “I have seen this movie” 13. Do you take any medicine?” said the doctor to the patient. 14. Ann said to Jim, “Will you help me with my maths?”

22. УМОВНІ РЕЧЕННЯ (CONDITIONAL SENTENCES).

В англійській мові є декілька типів умовних речень.

І тип: дія та умова **реальні**.

Умова у майбутньому

Головне речення		**Підрядне речення умови**
will (can, may, must, should) + V	**if**	Present Simple Present Perfect Present Continuous should + V

Приклади

If he finds her address (= If he should find her address), he will write to her. – Якщо він знайде її адресу, він їй напише.

She will pass the exam if she has studied hard. – Вона складе іспит, якщо старанно вчилась.

II тип: дія та умова **нереальні або малоймовірні**.

Припущення у теперішньому та майбутньому

Головне речення		**Підрядне речення умови**
would (could, might) + V	**if**	Past Simple were

Приклади

If he knew her address, he would (could, might) write to her. – Якби він знав її адресу, він би їй написав (міг би написати, ймовірно написав би).

If I were you, I would tell her the truth. – На твоєму місці я б сказав їй правду.

III тип: дія та умова **нереальні.**

Припущення у минулому

Головне речення		**Підрядне речення умови**
would (could, might) have + V-III	**if**	Past Perfect

Приклади

If he had known her address, he would (could, might) have written to her. – Якби він (ще тоді) знав її адресу, він би їй написав (зміг би написати; ймовірно, написав би).

Умовні підрядні речення приєднуються до головного наступними сполучниками: ***if*** *– якщо*, ***unless*** *– якщо не*, ***provided (that), providing (that)*** *– за умови, що (якщо)*.

В умовних реченнях сполучники ***provided*** та ***if*** можуть бути **відсутні**. В цьому випадку в умовному реченні дієслова ***could***, ***were***, ***had***, ***should*** ставляться перед підметом:

Приклади

Should he come, call me immediately. – Якщо він прийде, подзвоніть мені негайно.

Were you free next week, we could go fishing. – Якби ви були вільні наступного тижня, ми могли б поїхати на рибалку.

Had he been here yesterday, he would have helped you. – Якби він був тут вчора, він би вам допоміг.

22.1. Match two parts of the sentences.

1	If you find a job in another country,	a	will you take them back to the shop?
2	If your friend gets a promotion,	b	will you call the service?
3	If your new shoes don't fit properly,	c	will you answer it?
4	If your telephone rings at night,	d	will you move there?
5	If the lift in your house doesn't work,	e	will you take it to a recycling facility?
6	If you want to get rid of a used-up battery,	f	will you feel envy?

22.2. Open the brackets using the verbs in proper tense (Conditionals I, II, III).

1. The calculations would go faster if I (to have) a more powerful computer. 2. If it (to rain), we will have to cancel the field test. 3. If he (to work) hard, he would have achieved great progress. 4. If he comes too early, he (to have) to wait in the overcrowded hall. 5. We will cope with the task faster if he (to join) us. 6. If he (not to read) so much, he would not be so clever. 7. If my friend (to be) at home, he will tell us what to do. 8. If he were not such an outstanding actor, he (not to have) so many admirers. 9. If you (to give) me your E-mail address, I will send you the link. 10. If she (not to be) so absent-minded, she would be a much better student. 11. If my sister (not to go) to the sea, she will spend the summer in Kharkiv. 12. What would you do, if you (to fail) the entrance exam?

22.3. Open the brackets and put the verbs in the proper form (examples are taken from *The brief history of time* by Stephen Hawking)

1. There are some laws that tell us how the universe (to develop) with time, if we know its state at any one time. 2. If someone from another planet landed on Earth, what they (to do)? 3. If the sun (to explode), we would know about it only after eight minutes, the time it takes light to reach us from the sun. 4. If one looks at the sky on a clear, moonless night, the brightest objects one sees (to be) the planets Venus, Mars, Jupiter, and Saturn. 5. If we (to know) the luminosity of stars in other galaxies, we could work out their distance by measuring their apparent brightness. 6. If light from the sun (to pass) through a triangular-shaped piece of glass, called a prism, it breaks up into its component colors (its spectrum) as in a rainbow. 7. If we (to know) the positions and speeds of the sun and the planets at one time, then we could use Newton's laws to calculate the state of the Solar System at any other time. 8. It is a matter of common experience that disorder will tend to increase if things (to be) left

to themselves. 9. If the electric charge of the electron had been only slightly different, stars either would have been unable to burn hydrogen and helium, or else they would not have exploded. 10. If we knew the initial state of our universe, we (to know) its entire history. 11. Thus disorder (to tend) to increase with time if the system obeys an initial condition of high order. 12. If one (to know) the wave function at one time, one could calculate it at any other time. 13. Low-mass black holes could form only if matter (to be compressed) to enormous densities by very large external pressures. 14. If we could determine how many primordial black holes there are now, we (to learn) a lot about the very early stages of the universe. 15. If the search for primordial black holes (to prove) negative, it will still give us important information about the very early stages of the universe.

22.4. Open the brackets to use the appropriate verb form. Analyze the context carefully.

1. We don't know which road to take. If we (to bring) a map, we (to know) which way to go. 2. Antony is allergic to cheese. If he (to eat) cheese, he (to get) red spots on his body. 3. Felicia works in Microsoft, but if she (not to work) there, she (not to meet) her husband, David. 4. What you said to Max was very cruel! If I (to be) you, I (to apologize) to him. 5. John, are you looking for Susan? If I (to see) her, I (to tell) her to phone you. 6. These biscuits are really tasty! Why don't you want to sell them? If you (to sell) them, you (to make) a lot of money. 7. I can't speak French. If I (to study) it at school, I (not to speak) to my French boss in English now. 8. If you (to buy) two packets of spaghetti, you (to get) one free. 9. If I still (to feel) ill, I (not to visit) my grandmother next weekend. 10. What you (to do) if you (to see) a bank robbery? – I (to phone) the police.

22.5. Translate into English using Conditionals I, II and III.

1. Якщо лід нагріти, він розтане. 2. Якщо б ми змогли знизити температуру на один градус, ми б відкрили нові властивості цього матеріалу. 3. Якщо б він застосував якийсь інший метод дослідження, він би отримав кращий результат. 4. Міст не зруйнувався б так швидко, якщо б інженери зробили вірні розрахунки на витривалість. 5. На твоєму місці я б вивчив усі правила роботи з цим обладнанням. 6. Я був би радий, якщо б в мене була можливість залишитись і побачити кінцевий результат випробувань. Але мені треба негайно піти. 7. Якщо експерименти на підтвердження його теорії будуть успішні, то

результати його дослідження будуть опубліковані в зарубіжному виданні. 8. Доповідь консультанта з безпеки відбудеться наступної п'ятниці, якщо його розклад не зміниться. 9. Якщо змінити один з параметрів цього рівняння, то воно не буде описувати даний хімічний процес. 10. Якщо б вчені замовили усі необхідні матеріали минулого тижня, дослідження вже було б закінчено. 11. Цей регіон дав би вдвічі більше електроенергії, якщо б ще минулого року там було побудовано електростанцію. 12. Студент вже давно б склав іспит, якщо б добре вивчив матеріал. 13. Він не зміг би вирішити це рівняння, якщо б не був присутнім на останній лекції. 14. Якщо електрони проходять через газ, вони його іонізують. 15. Якщо б усі частинки були електрично нейтральні, то вони б не відбивались магнітним полем. 16. Якщо будуть виконані вхідні умови, то вчені отримають необхідний результат. 17 Якщо б ти не спізнився на роботу, твій начальник не розсердився б.

22.6. Choose the correct option.

1. If you ___ a taxi, you would catch the last train.
a) will take b) have taken c) took d) would take
2. The scientist would start the experiment if he ___ all the necessary equipment.
a) would get b) will get c) get d) got
3. If I had had time, I would ___ you.
a) help b) have helped c) helped d) has helped
4. If she ___ the job, I think she would take it.
a) offered b) had been offered c) would offered d) was offered
5. If we ___ a message from him, we wouldn't worry.
a) received b) would received c) had been received d) was received
6. If you make so much noise, we ____ hear nothing.
a) will b) will not c) would d) would not
7. If I ___ you, I would choose another colour.
a) am b) were c) have been d) be
8. I need this computer but it is very expensive. I ___ it if I have more money.
a) would buy b) will buy c) buy d) have bought
9. If he had been able to speed up his research, he ____ his thesis by now.
a) would complete b) had completed c) would have completed d) completed
10. If she ____ this advice, her CV will be much better.
a) followed b) follows c) would follow d) had followed

11. You will not be able to solve this problem unless you ___ the research team.
a) will join b) would join c) joins d) join
12. He will receive this job if he ___ through the interview.
a) goes b) went c) gone d) had gone
13. If I had more free time today, I ___ the book I borrowed from the library.
a) read b) will read c) would read d) had read
14. If she uses computer presentation, her report ___ much more interesting.
a) would be b) would have been c) was d) will be
15. What would happen if I ___ that button?
a) pressed b) had pressed c) would press d) would have pressed
16. Provided you ___ the time of your visit, inform us beforehand.
a) would change b) will change c) changed d) change
17. Had he ___, he would have called me.
a) had time b) time c) been time d) has time
18. Were he present, he ___ our argument.
a) resolves b) would resolve c) will resolve d) resolved
19. Provided we ____ from you by Friday, February 10th, we will assume that you are not coming.
a) wouldn't hear b) didn't hear c) won't hear d) don't hear
20. If the goods ___ not picked up within the time period, we will be forced to dispose of the goods.
a) did b) do c) are d) will

APPENDIX 1. COMMON FUNCTIONAL AND LINKING WORDS

LIST OF MOST COMMON LINKING WORDS

Adding information	Cause	Effect
• ... and ... • as well as ... • also + Verb • not only..., but also ... • too. / as well. • In addition, / Besides that, / Furthermore, / Moreover, • Apart from / Besides + Noun / V-ing • Another point (idea, suggestion) is • One more point (idea, suggestion) is • The following point (idea, suggestion) is	• because + <sentence> • because of + <Noun> • since + <sentence> • as + <sentence> • due to + <Noun> • owing to + <Noun> • as a result of + <Noun> • provide(s) • force(s) • explain(s) the reason why • cause(s) • result(s) in • produce(s) • lead(s) to • make(s)	• so • that (which) is why • therefore • consequently • explains why • is the reason why • is provided by • is explained by • is caused by • result(s) from • is produced by
Compare	**Contrast**	**Emphasizing**
• both ... (and) • each • same • also • equal (to) • like • analogous to • similar(ly) • alike • likewise • as ... as • as well as • as well (too)	• different • different from • differ • otherwise • not so (as) ... as • <Comp. Adj.> than • instead of • in comparison to / compared to • in contrast to / with • even though • although • despite / in spite of • but • yet / nevertheless / however • unlike • conversely • on the other hand • whereas	• whole • entire(ly) • exact(ly) • indeed • real(ly) • extreme(ly) • high(ly) • specific(ly) • special(ly) • absolute(ly) • only • even • the best etc.

Giving Examples	Sequencing	Structure
• for example (e.g.) • for instance • that is (i.e.) • such as • including • namely (viz.)	• first / at first / initially • then / afterward(s) / next / later / subsequently • after + V-ing • previously • before • when / as soon as • at this time (point) • meanwhile / in the meantime • during + Noun • while + V-ing • finally / lastly / in the end / at last / eventually / at length / ultimately	• consists of • includes • contains • comprises • incorporates • is composed of • is made up of • are (integral) parts of • are components of • are constituents of • There are ... in / on / inside ...

1. GIVING DEFINITIONS (EXPLANATIONS)

Explicit ways

Term	Verb	Class	Details / Features
A disease	is is known as may be defined as means	an abnormal condition of the body	that has a specific cause and characteristic outward 'signs' and symptoms.

Class	Details / Features	Verb	Term
A process in a chemical reaction	which causes solid particles to become separated from a liquid	is called is known as can be defined as	precipitation

1.1. Identify the language used to give definitions.

1. Communication is the process of transferring meanings from sender to receiver. 2. Exports are goods and services produced by a firm in one country and then sent to another country. 3. Proxemics is a form of non-verbal communication which deals with how people use physical space to convey messages. 4. Voluntary actions or activities are done because someone chooses to do them and not because they have been forced to do them. 5. Things which are simultaneous happen or exist at the same time. 6. The degree to which the result of a measurement, calculation, or specification conforms to the correct value or a standard is usually called accuracy. 7. Electrolysis refers to the decomposition of a substance by an electric current. 8. Ionic motion throughout the bulk of the solution occurs mostly by diffusion, which is the transport of molecules in response to a concentration gradient. 9. Metalworking machine tools definition includes a wide variety of machines having as common denominator that they are powered to manufacture products or parts (usually metallic but not only). We call machine tools the mother machines since they are the machines enabling the production of all the other machines including themselves. 10. Planetary geology is the study of the solid matter that makes up celestial bodies, such as planets, moons, asteroids, and comets. This branch of geology focuses on the materials that make up these celestial bodies and how the bodies are formed. 11. The Atomic Number of an element is the number of protons or positive charges which are present in the nucleus of the atoms of that element. 12. Atomic particles are themselves composed of sub-

atomic particles (i.e. the quarks and leptons). These sub-atomic particles are also called the fundamental particles or elementary particles.

1.2. Insert suitable category words in the following definitions.

1. A barometer is a scientific ___ designed to measure atmospheric pressure.
2. Kidneys are ___ that separate waste fluid from the blood.
3. A multi-national company is a business ___ that operates in many countries.
4. Reinforced concrete is a building ___ consisting of cement, sand and steel rods.
5. Bullying is a pattern of anti-social ___ found in many schools.
6. Recycling is a ___ in which materials are used again.
7. A recession is a ___ of reduced economic activity.
8. Post codes are a ___ for making mail delivery more efficient.

1.3. Give your own definitions of the following objects.

A pencil; a thermometer; a telephone; a web-camera; electric current; a language; sound.

2. GIVING EXAMPLES

Patterns

For example (e.g.),
For instance,
... such as
... as follows
... the following examples
... namely

Verbs

to give	an / the example
to produce	
to supply	
to provide	
to present	
to make	
to draw	

Examples

Personal electronic devices (e.g., cell phones, laptop computers) may not be used during the flight.

A number of weather variables were recorded, e.g. precipitation, temperature, and relative humidity

2.1. **Give as many examples of the following categories as possible. Use followers to add examples. E.g.:** ***There are many professions such as engineers, teachers, doctors. Other examples include drivers, shop assistants, waiters and many more.***

1. Professions, writing tools, metals, communication devices, insects, colours. (orally)
2. The most popular actors, the most useful tools at home, the most successful businesses, the latest technological achievements. (orally)
3. Chemical vessels students use in the lab, machine parts that can be used in different machines, physical laws we encounter every day, important discoveries of the last decade. (in writing)

3. STRUCTURE AND LOCATION

X	consists of	Y and Z
	is composed of	
	is made up of	
	contains	
	includes	
	comprises	
	incorporates	

There are	Y and Z	in / on / inside	X

Y and Z	are parts of	X
	are components of	
	are constituents of	

A is	above	B
	below	
	in front of	
	facing	
	behind	
	opposite	
	in the middle of	
	on the right of	
	on the left of	
	near	
	close to	
	over	
	under	
	beyond	
	between	B and C

3.1. Find words and expressions describing structure.

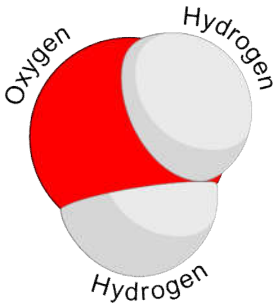
1. The primary components of a car are the power plant, the power transmission, the running gear, and the control system. These constitute the chassis, on which the body is mounted. 2. The power plant includes the engine and its fuel, the carburetor, ignition, lubrication, and cooling systems, and the starter motor. 3. Animals are made up of specialized cells, such as blood cells, cartilage cells, fat cells, muscle cells, nerve cells; humans have about 350 different cell types while lower animals, like

hydra, only 10 to 20. 4. The life of the cell is dependent on the chemical reactions among the many million constituent molecules. 5. One component unit of a computer is a Memory Unit or store. 6. There are three elements required by any computer system: the hardware units; the operating system software; the application programs. 7. DNA is made up of four different parts called nucleotides. 8. The U.S. Senate consists of two elected officials from each state. 9. The list includes the names of many famous writers. 10. The largest component of soil is the mineral portion, which makes up approximately 45% to 49% of the volume. 11. The diet incorporates many different fruits and vegetables. 12. The remainder of the unit comprises warehouse accommodation and includes a roller shutter door.

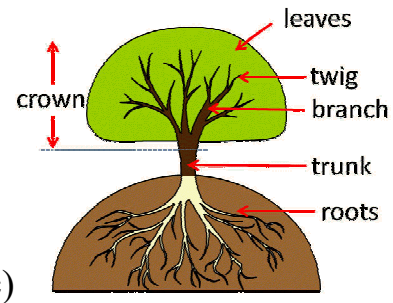
3.2. Match the sentence halves.

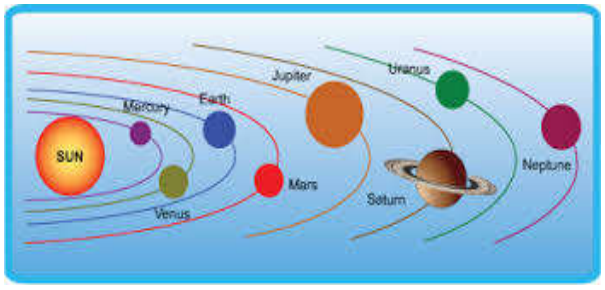
1	Fast food usually contains	a	plasma, red blood cells, white blood cells, and platelets.
2	This book includes	b	tiny units called pixels.
3	A walleyball team consists of	c	four appendices.
4	Any digital image is made up of	d	nitrogen (78%) and oxygen (21%).
5	The main components of blood are	e	high amount of calories.
6	There are two main constituents of air:	f	six players.

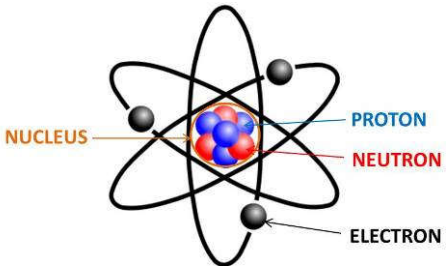
3.3. Describe the structure of the following objects using all possible expressions.

a) 

b) 

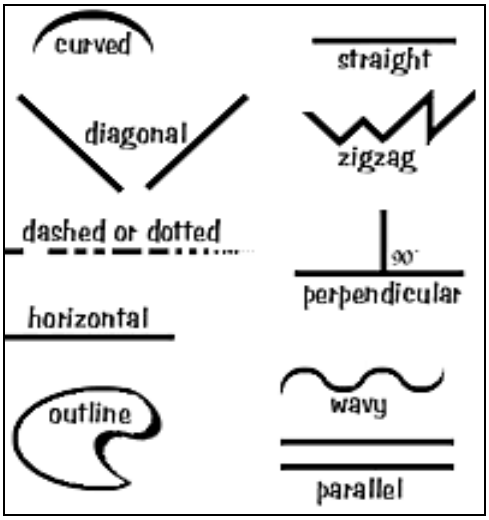
c) 

d) 

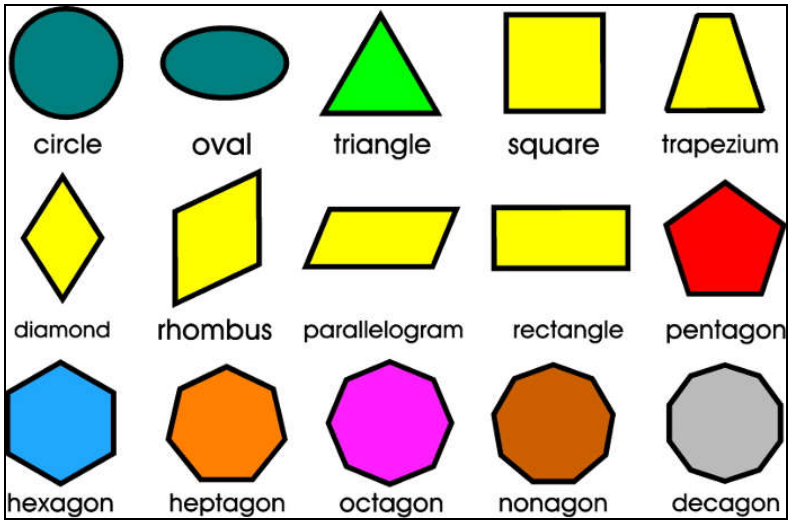
e) 

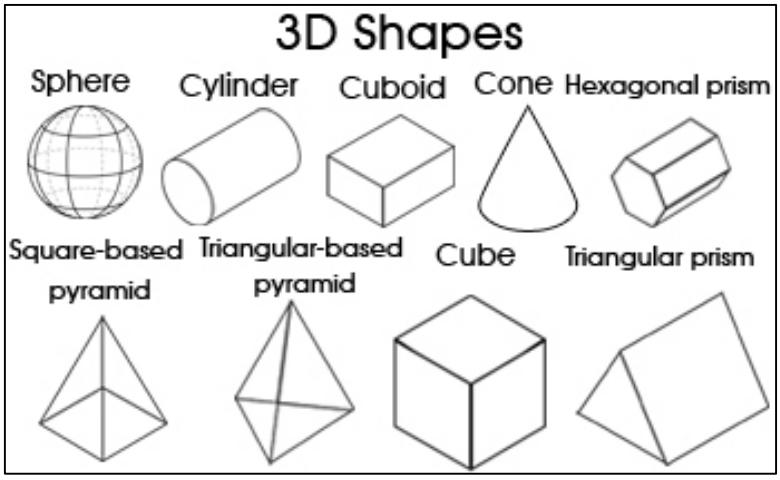
4. SHAPES AND SIZES

Lines



2D shapes (Flat shapes)





Describing the shape

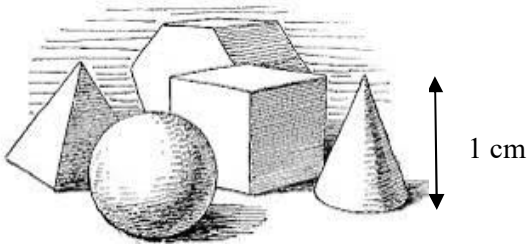
Object	Verb	Noun
X	is shaped like a has a form of a has a shape of a	round oval square triangle circle rectangle hexagon cylinder cone

Object	Verb	Adjective	
X	is	round oval square triangular circular rectangular hexagonal cylinder cone	in shape
			-shaped

Describing linear sizes and weight

The length of the <object> is 5 m.	The <object> is 5 m long.
The thickness of the <object> is 5 m.	The <object> is 5 m thick.
Dimensions (HWD)	
The height of the <object> is 5 m.	The <object> is 5 m high.
The width of the <object> is 5 m.	The <object> is 5 m wide.
The depth of the <object> is 5 m.	The <object> is 5 m deep.
Weight	
The weight of the <object> is 5 kg.	The <object> weighs 5 kg.

4.1. Describe the figures you see on the picture. Calculate the volume of the figures and explain the process of calculation.



4.2. Describe the shapes of the following buildings. Try to guess their dimensions. Learn more about them (in the Internet) and give a short report including a) the purpose of the building; b) the size (dimensions); c) the place; d) the date of construction; e) materials used; f) the designer (if any) etc.

a) 

b) 

c) 

d) 

5. ADDING INFORMATION

Vocabulary	**Examples**
and	We discussed training, education **and** the budget.
In addition, / Besides that,	We discussed training, education and the budget. **In addition**, we talked about staff.
as well as ...	**As well as** the costs, we are concerned by the competition. We are interested in costs **as well as** the competition.
also + Verb	We **also** spoke about marketing
not only..., but also ...	We are concerned **not only** by the costs, **but also** by the competition.
too. / as well.	They were concerned **too (as well)**. I, **too**, was concerned.
Furthermore, / Moreover,	Marketing plans give us an idea of the potential market. **Moreover**, they tell us about the competition.
Apart from / Besides + Noun / V-ing	**Apart from** Rover, we are the largest sports car manufacturer. **Besides** being the best student in the group, he finds time to play football and sing in a choir.

5.1. Find the words and expressions that signal adding information.

Solar energy is a resource that is not only sustainable for energy consumption, but also is indefinitely renewable (at least until the sun runs out in billions of years). Solar power can be utilized to generate electricity, besides it is used in relatively simple technology to heat water (solar water heaters). The use of skylights in home construction can also greatly reduce energy expenditure required to light rooms in a homes interior during the day. Furthermore, solar power helps to slow or even stop global warming mainly caused by burning fossil fuels and emitting greenhouse gases.

5.2. Use each of the connectors to join these sentences.

John is a successful businessman. He is a good sportsman.

6. GENERALIZATION

Percentage	Quantity	Frequency	Certainty	Verbs
100%

to own one would still use a landline at home because it was cheaper. Mobiles were mainly attractive for people on the move, but have now become indispensable – the first thing you reach for to make and receive calls, send a text or browse the Internet.

Even though the landline phone is not quite dead yet, it's been in decline for a few years. However, there is a generational divide between the young and old: 80% of people aged under 30 don't have a home phone or hardly ever use one, according to Money Saving Expert. On the other hand, half of people over 60 still use their home phone for most calls. There seems to be something of an emotional attachment to landlines, or perhaps a resistance to new technology that may be perceived as expensive and difficult to use for the older generation.

6.2. Decrease the level of generalization in the following sentences.

1. There are lots of advantages of using landline phones – voice quality on a landline is always better than on a mobile, and there are few issues with dropped calls or cell capacity. 2. Many people know their own family's mobile numbers. 3. Only a decade ago, all students were making notes in their notebooks during the lectures, while today's lecture must be simply recorded on a smartphone. 4. All people use their mobiles for the longest periods of time at home. 5. As a rule, people speak over the telephone while watching TV. 6. For anyone that lives in an area with decent network coverage and uses a smartphone every day, doing away with a landline is a viable option that shouldn't cause too much inconvenience. 7. Cell phone plans always have a limited number of allocated minutes for calls, while all landline telephone plans include unlimited minutes at the lowest rate.

7. COMPARING AND CONTRASTING

Compare	both ... (and)	Tom and Ann **both** have dogs. **Both** Tom **and** Ann are students.
	same	The results of these tests are **the same**.
	also	A mouse is **also** an input device.
	equal (to)	Ukraine is almost **equal** in size **to** France.
	similar(ly)	They behave **similarly**. These triangles are **similar**.
	as ... as	This problem is **as** difficult **as** the previous one.
	as well as	**The coach,** as well as **the team, is ready.**
	as well (too)	**He has bought a car. She has bought one** as well (too)**.**

Contrast	different	I have a **different** idea. The ability to reason makes man **different from** animals.
	not so (as) ... as	The devil is **not so** black **as** he is painted.
	<Comp. Adj.> than	The temperature today is **higher than** yesterday.
	in comparison to / compared to	Computers-based communication is extremely fast **in comparison to / compared to** telephone services.
	in contrast to / with	The white roses looked lovely **in contrast with** the red ones.
	even though	**Even though** we fail, the very mistakes we make will be invaluable.
	although	**Although** this machine is very old, it is still usable.
	despite / in spite of	**Despite** / **in spite of** being a millionaire, he lives in a very small flat.
	but / while / yet	Everybody wanted to go to the cinema, **but** he insisted on staying home.
	unlike	**Unlike** the others, he was very calm.

7.1. In the sentences, find the functional words and expressions and determine their function – compare or contrast.

1. It is estimated that the world's oil reserves will last for about 50-60 years, whereas sunlight is available forever and can be utilized till the end of this planet. 2. Unlike fossil fuels, which will expire in another few decades, wind energy is never going to end. 3. Learning to ride a bike is as easy as, say, learning to skate. 4. All manufactured goods have environmental impact, but bicycles can be produced for a fraction of the materials, energy and shipping costs of a car. 5. A 20-pound bicycle is a lot less rough on the pavement than a two-ton sedan. 6. Cars need much more parking space than bicycles. 7. There is evidence that riding a bike can act like natural painkiller if you are relatively fit. 8. Energy we receive from the sun can be used to generate electricity. Similarly, energy from wind, geothermal sources or tides can be used to fulfill our daily energy demands.

7.2. Describe 3 similarities and 3 differences of the given objects using active vocabulary.

a) 

b) 

c) 

d) 

8. CAUSE & EFFECT

Conjunctions

Cause
because / since / as + <clause>
because of + <Noun>
due to / owing to + <Noun>
as a result of + <Noun>

Effect
so
that (which) is why
therefore
consequently

Examples

Lots of electrical lines were damaged **because of** terrible wind.

He is really hard-working. **That's why** he has easily passed all the exams.

Verbs

<Cause>	cause(s)	<Effect>
	result(s) in	
	provide(s)	
	explain(s) why	
	lead(s) to	

<Effect>	is caused by	<Cause>
	result(s) from	
	is provided by	
	is explained by	

Examples

Telephoning while driving may **result in** accidents.

Blue screens **are caused by** hardware problems.

8.1. In the text, find ideas that serve as a Cause or an Effect.

In nature there are indicator species that characterize the condition of the environment. Bees are an indicator species. Honeybees pollinate 70% of the species of crops that we regularly use. The honeybee population is dying due to pesticides and environmental changes. If bees go extinct, over 80% of our fruits and vegetables will be gone. Researchers claim that cereal would more than likely be our main source for nutrition if such disaster happens.

Bees are dying off very fast. Environmental changes such as pollution are one of the main causes for the plummeting population, along with pesticides and other unhealthy chemicals put in farming. Though only a small amount of action is being taken to help save bees, it is crucial that more attention should be given to such situation before bees become extinct.

8.2. Insert the following words and expressions to complete the following paragraph.

as a result of	caused by	owing to	result in	because of	due to

The process of corrosion is a complex electro-chemical reaction and it takes many forms. Corrosion may produce general attack over a large metal surface or it may ___ pinpoint penetration of metal. Corrosion is a relevant problem ___ water in boilers. Corrosion can be of widely varying origin and nature ___ the action of dissolved oxygen, to corrosion currents set up ___ heterogeneities on metal surfaces, or to the iron being directly attacked by the water. While basic corrosion in boilers may be primarily ___ reaction of the metal with oxygen, other factors such as stresses, acid conditions, and specific chemical corrodents may have an important influence and produce different forms of attack. It is necessary to consider the quantity of the various harmful substances that can be allowed in the boiler water without risk of damage to the boiler. Corrosion may occur in the feed-water system ____ low pH water and the presence of dissolved oxygen and carbon dioxide.

8.3. Look at the pictures. Compose sentences using the pictures as either a cause or an effect or both.



9. DESCRIBING SEQUENCES OF ACTIONS

Function	**Words**	**Examples**
Start	first / at first / initially to begin with	To start a computer we first plug it into the mains.
Next step	then / after that afterward(s) next / later subsequently In the next stage, Following this, after + Noun / V-ing	Then we push the start button on the system unit.
Temporary stop or return	previously before + Noun / V-ing	Before going on, make sure your keyboard is connected to the computer.
Action made at the same stage	when + <Clause> at this time (point) meanwhile during + Noun while + V-ing	When an invitation box appears on the screen, we enter the password. While typing the password we should be careful because the letters we type are replaced with dots.
Conditions	if... (then ...) otherwise either ... or	If the password is correct, we can start working, otherwise the computer will ask us to repeat entering the password.
End	finally / lastly / in the end / eventually	So, in the end we find ourselves working on our favourite desktop.

9.1. In the text, find sequence words.

First of all, letters and packets are collected in bags from pillar boxes, post offices and firms, in post office vans. They are then taken to the sorting office, where the bags are emptied and the letters separated from the packets. Following this step, the letters are put through machines so that the stamps can be cancelled. In this process the date and place of sorting are put over the stamps on each envelope. In the next stage, the sorting of the letters takes place, according to the county they are addressed to. This is done by placing them in the appropriate pigeon hole. Subsequently, the letters are taken from the pigeon holes and placed in baskets, which are then put onto a conveyor belt. While on this conveyor belt, the baskets are directed to the appropriate secondary sorting section by means of coding pegs. At the secondary sorting frames, the letters are put into towns in the county. Later, the letters are tied in bundles and a label is put on showing the towns they are addressed to. Finally, the letter bundles are placed in bags, which have the Post Office seal, Post Office Railway number and Destination Code number on them, and then these are sent to the railway station.

9.2. Put the actions in the correct order. Describe the process adding sequence words where necessary.

a) Take the bulb out of the socket. To do this, keep gently twisting the bulb anticlockwise until it comes loose from the socket.

b) Use the packaging from the new bulb to wrap the old one for safe disposal. The old bulb needs to be disposed of safely as the glass is fragile and very sharp.

c) Use a stepladder to safely reach the bulb.

d) Make sure the power is turned off. The safest way to do this is to switch the large red power button to “off” on the fuse box.

e) Insert a replacement bulb lightly but firmly into the socket. Depending on the type, turn it clockwise until it won’t go any further.

f) Turn the power back on again and switch on the light.

g) Allow the bulb to cool before touching it.

10. EMPHASIZING

- Strong words

whole, entire(ly), exact(ly), genuine(ly), indeed, real(ly), ultimate(ly), extreme(ly), high(ly), specific(ly), special(ly), absolute(ly), only, the best etc.

- Inversion

Little **did I understand** what was happening.
Hardly **had I arrived when** he started complaining.
Seldom **have I felt** so alone.

- Continuous

Ann **is always getting** into trouble.

- It is (was) ... that (who)

It is I who received the promotion.
It is the awful weather that drives him crazy.
It was not until last year that he finally found his dream job.

- What ...

What we need is a good long shower.
What he thinks isn't necessarily true.

- Do (does, did) in affirmative sentences

I **do believe** that you should think twice about this situation.

- Adverbs *such*+Noun, *so*+Adjective (Adverb), *too*+Adjective (Adverb)

That was **such a difficult problem that** nobody could solve it.
She was **so absent-minded**.
The shoes were **too** tight for me.

10.1. Underline the words and expressions signaling emphasizing.

1. No nuclear technology can be completely safe, and many of the more efficient nuclear cycles require isolating plutonium, an extremely toxic material that can also be used in weapons. 2. Solar PV and offshore wind may be the only renewable sources abundant enough to displace fossil fuels. 3. In analyzing costs, we should consider both the market costs of supply and the environmental costs of various energy sources. It is to this analysis that we now turn. 4. In Europe, offshore wind is significantly further developed, with 64 operating offshore wind farms as of 2014. 5. Few homeowners would purchase a gas furnace and at the same time purchase all

the gas the furnace would use over its life. Yet by their nature, this is what is expected for most renewable energy sources. 6. Not only does the use of renewable energy sources help reduce global carbon dioxide emissions, but they also add some much-needed flexibility by decreasing our dependence on limited reserves of fossil fuels. 7. Though there is a large quantity of solar radiation falling on the earth every day, it is dissipated over the whole earth's surface, and collecting such dispersed energy is costly indeed. 8. But many of these new technologies do involve higher costs, so an upward trend in fossil fuel prices over time is likely.

10.2. Make the underlined parts of the sentences more emphatic using the words in the box.

much	dramatically	does	absolutely	any	so ... that	ever	only

1. Gadgets are created to help reduce our efforts and ___ save the time in doing chores. 2. Human dependence on technological devices is ___ immense ___ people stop being able to function without them. 3. In 2009, 29.4 million computers were disposed of, but ___ 18 million computers were recycled properly. 4. Not only ___ our demand for electronics harm the environment, but it can also harm our relationships. 5. The "graphics" outside are ___ more realistic than ___ video game ___ will be. 6. It is ___ impossible to imagine modern communication without Internet.

APPENDIX 2. HOW TO WRITE AN ABSTRACT

An abstract is a short summary of your completed research. If done well, it makes the reader want to learn more about your research. These are the basic components of an abstract in any discipline:

1) Motivation / problem statement: Why do we care about the problem? What practical, scientific, theoretical gap is your research filling?

2) Methods / procedure / approach: What did you actually do to get your results? (e.g. analyzed 3 approaches, completed a series of 5 tests under different conditions, interviewed 17 respondents).

3) Results / findings / product: As a result of completing the above procedure, what did you learn / invent / create?

4) Conclusion / implications: What are the larger implications of your findings, especially for the problem / gap identified in step 1?

Language tips

The abstract for a scientific paper is mainly formulated using Present Simple and Present Perfect tenses for describing the methods and results. Past Simple is also common in abstracts to refer to the procedures and experiments applied.

As the abstract is written mainly when the authors have finished their research and consider it a scientific result, the language should be as impersonal as possible. For this end, Passive Voice is mostly appropriate. Nevertheless, Active Voice is also very common. Try not to use pronouns like *we* or *I* or *our*. Instead, reference words e.g. *the given, the problem in question, the data obtained* etc. will be more adequate.

There are some expressions generally used for writing an abstract. You should remeber, though, that these are just examples and you can exploit any other language to express your ideas.

The state of the problem, the goals	
The article (paper) is devoted to ...	Стаття присвячена ...
The article (paper) deals with ...	Стаття присвячена ...
... are well studied	... добре вивчені
... are little studied at a fundamental level	... слабо вивчені на фундаментальному рівні
The main goal is ...	Основною метою є ...

Methods, procedures, approaches	
is presented (is studied; is discussed; is reported; is investigated; is analyzed)	Представлено... (вивчається ...; розглядається ...; повідомляється про ...; досліджується ...; аналізується ...)
The major attention is paid to ...	Основна увага приділяється ...
is investigated using ...	... досліджується з використанням ...
method is applied	... застосовується метод ...
is quantified by measuring ...	... кількісно оцінюється вимірюванням ...
is examined statistically...	... досліджується статистично ...
Calculations, simulations, experiments	
is applied to compute ...	Для обчислення ... використовується ...
have been calculated using ...	... вычисляется с использованием ...
calculations have been carried out	... проведено обчислення
simulations / experiments were performed using	виконане моделювання / експерименти з використанням
Several experiments are suggested.	Представлено декілька експериментів з
Results. Conclusions	
The results show that ...	Результати показують, що ...
It is shown that / It is demonstrated that	Показано, що
It is stated that ...	Стверджується, що
The influence of the ... on the ... is demonstrated.	Показана залежність ... від ...
... is shown to be dependent on ...	Показано, що ... залежить від ...
It is concluded that ...	Робиться висновок, що ...
... provide key information for ...	... дає ключову інформацію для ...
... provide a basis for explaining ...	... дає грнт для пояснення ...
Comparison of the results	
The results obtained agree satisfactorily with recent analyses.	Отримані результати добре узгоджуються з останніми дослідженнями.
The present results are in apparent contrast to ...	Отримані результати явно протирічать
Experiments confirm most of the theoretical predictions.	Експерименти підтверджують більшість теоретичних припущень.
These conclusions are supported by the experimental data.	Ці висновки підкріплені експериментальними даними.

As an example, analyse the abstract written to the text from Unit 1.

SCIENTISTS TO DRILL DEEP THROUGH EARTH'S CRUST

A team of scientists is preparing a new attempt to drill through the Earth's crust to the mantle below for the first time ever. The team will soon drill beneath the Pacific to test the viability of such an operation, and say an attempt to reach the mantle could begin in 2018.

They've selected prospective sites under the Pacific Ocean where the crust is at its thinnest – just six kilometres.

Dr Damon Teagle, of the UK's National Oceanography Centre in Southampton, is leading the quest. He likens the bid to the retrieval of Moon rocks by the Apollo programme and says samples from the mantle will tell us how our planet was formed and how it's changing: "Just as the Moon rocks told us about the composition of the Moon and how that relates to the early formation of the Earth itself, so will these samples as well."

Abstract

The article is devoted to the experiments to drill through the Earth crust. The aim of the undertaking is to get the samples from the mantle. The drilling is planned to be done under the Pacific Ocean. The similarity between the programme and the Apollo mission is demonstrated. It is concluded that the results will help understand the formation and change of our planet.

APPENDIX 3. IRREGULAR VERBS

Infinitive	Past Indefinite	Participle II	Translation
be	was; were	been	бути, знаходитись
bear	bore	born	носити, витримувати
become	became	become	стати
begin	began	begun	починати(ся)
bind	bound	bound	зв’язувати
bite	bit	bitten	кусати
blow	blew	blown	дути, дмухати
break	broke	broken	ламати
bring	brought	brought	приносити
build	built	built	будувати
burn	burned / burnt	burnt	горіти
burst	burst	burst	вибухати
buy	bought	bought	купувати
catch	caught	caught	ловити
choose	chose	chosen	обирати
come	came	come	приходити
cost	cost	cost	коштувати
cut	cut	cut	різати
deal	dealt	dealt	мати справу (з чимось)
dig	dug	dug	копати
do	did	done	робити
draw	drew	drawn	малювати, тягнути
dream	dreamed / dreamt	dreamt	бачити сни, мріяти
drink	drank	drunk	пити
drive	drove	driven	вести (автомобіль), направляти
eat	ate	eaten	їсти
fall	fell	fallen	падати
feed	fed	fed	годувати
feel	felt	felt	відчувати
fight	fought	fought	боротися, битися

Infinitive	Past Indefinite	Participle II	Translation
find	found	found	знаходити
fly	flew	flown	літати
forbid	forbade	forbidden	забороняти
forget	forgot	forgotten	забувати
forgive	forgave	forgiven	простити
freeze	froze	frozen	замерзнути
get	got	got	отримати
give	gave	given	давати
go	went	gone	йти, їхати
grind	ground	ground	точити, молоти
grow	grew	grown	рости, вирощувати
hang	hung	hung	висіти, повісити
have	had	had	мати
hear	heard	heard	чути
hide	hid	hidden	ховати(ся)
hit	hit	hit	вдарити
hold	held	held	тримати, проводити
hurt	hurt	hurt	поранити, боліти
keep	kept	kept	зберігати, тримати
know	knew	known	знати
lay	laid	laid	класти
lead	led	led	вести
learn	learned / learnt	learnt	вчити(ся)
leave	left	left	залишати, покидати
lend	lent	lent	давати в борг
let	let	let	дозволяти
lie	lay	lain	лежати
lose	lost	lost	(за)губити
light	lit	lit	запалювати, освітлювати
make	made	made	робити
mean	meant	meant	значити
meet	met	met	зустрічати,

Infinitive	Past Indefinite	Participle II	Translation
			знайомитись
pay	paid	paid	платити
put	put	put	покласти
read	read	read	читати
ride	rode	ridden	їздити верхи
ring	rang	rung	дзвонити
rise	rose	risen	підніматись
run	ran	run	бігти
saw	sawed	sawn	пилити
say	said	said	говорити, казати
see	saw	seen	бачити
seek	sought	sought	шукати
sell	sold	sold	продавати
send	sent	sent	надсилати
set	set	set	ставити, встановлювати
shake	shook	shaken	трясти
shoot	shot	shot	стріляти
show	showed	showed / shown	показувати
shut	shut	shut	зачиняти
sing	sang	sung	співати
sit	sat	sat	сидіти
sleep	slept	slept	спати
slide	slid	slid	ковзати
smell	smelled / smelt	smelt	пахнути, нюхати
speak	spoke	spoken	говорити
speed	sped	sped	пришвидшувати, поспішати
spend	spent	spent	витрачати
split	split	split	розщепити
spoil	spoiled / spoilt	spoilt	псувати
spread	spread	spread	розповсюджувати
stand	stood	stood	стояти

Infinitive	Past Indefinite	Participle II	Translation
steal	stole	stolen	вкрасти
stick	stuck	stuck	приклеїти(ся)
swim	swam	swum	пливти
take	took	taken	брати
teach	taught	taught	навчати
tear	tore	torn	рвати
tell	told	told	розповідати
think	thought	thought	думати
throw	threw	thrown	кидати
understand	understood	understood	розуміти
wake	woke	woken	прокидатися
wear	wore	worn	носити, зношуватись
win	won	won	вигравати
wind	wound	wound	заводити (годинник), витися
write	wrote	written	писати

Active Voice

	Past	Present	Future
Indefinite	**V-ed / V-II** ***yesterday, last year*** I (you, he, we, they) chose	**V, V-s** ***every day, usually, often*** I (you, we, they) choose He (she, it) chooses	**will + V** ***tomorrow, next week*** I (you, he, we, they) will choose
Continuous	**was (were) + V-ing** ***yesterday at 5 o'clock, from 5 till 7*** I (he) was choosing We (you, they) were choosing	**am (is, are) + V-ing** ***now, at the moment*** I am writing He (she, it) is choosing We (you, they) are choosing	**will be + V-ing** ***tomorrow at 5 o'clock, the whole day tomorrow*** I (you, he, we, they) will be choosing
Perfect	**had + V-ed / V-III** ***by 5 o'clock yesterday, before I came home*** I (you, he, we, they) had chosen	**have (has) + V-ed / V-III** ***already, just, recently, lately, yet (-/ ?), ever, never*** I (you, we, they) have chosen He (she, it) has chosen	**will have + V-ed / V-III** ***by 5 o'clock tomorrow, by the end of the next month*** I (you, he, we, they) will have chosen
Perfect Continuous	**had been + V-ing** ***for 3 hours before you came*** I (you, he, we, they) had been choosing	**have (has) been + V-ing** ***for 3 hours, since the morning*** I (you, we, they) have been choosing He (she, it) has been choosing	**will have been + V-ing** ***tomorrow… for 3 months*** I (you, he, we, they) will have been choosing

Passive Voice

	Past	Present	Future
Indefinite	**was (were) + V-III** ***yesterday, last year*** I (he, she, it) was chosen You (we, they) were chosen	**am (is, are) + V-III** ***every day, usually, often*** I am chosen He (she, it) is chosen You (we, they) are chosen	**will + be + V-III** ***tomorrow, next week*** I (you, he, she, it, we, they) will be chosen
Continuous	**was (were) + being +V-III** ***yesterday at 5 o'clock, from 5 till 7*** I (he, she, it) was being chosen We (you, they) were being chosen	**am (is, are) + being +V-III** ***now, at the moment*** I am being chosen He (she, it) is being chosen We (you, they) are being chosen	↥ ***tomorrow at 5 o'clock, the whole day tomorrow***
Perfect	**had + been + V-III** ***by 5 o'clock yesterday, before I came home*** I (you, he, she, it, we, they) had been chosen	**have (has) + been + V-III** ***already, just, recently, lately, yet (-/?), ever, never*** I (you, we, they) have been chosen He (she, it) has been chosen	**will have + been + V-III** ***by 5 o'clock tomorrow, by the end of the next month*** I (you, he, she, it, we, they) will have been chosen
Perfect Continuous	↥ ***for 3 hours before you came***	↥ ***for 3 hours, since the morning***	↥ ***tomorrow… for 3 months***

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ЗМІСТ

Навчальне видання

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Англійською та української мовою

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